RAILROAD GAZETTE

FRIDAY, SEPTEMBER 13, 1895.

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Contributions.

Facts for a Sound Policy.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial article reviewing the facts hinted at in my previous letter would seem more sound than hopeful, more honestly cautious than courageous. But are you quite sure that hope and courage as well as sound opinions may not be supported by facts? Let us see.

In a certain legislature, a very small ring—we need a careful quantitative analysis to properly estimate such cases—determined on a financial speculation. Even with an honest legislature of the unsuspecting kind, such speculations are possible. A bill was introduced and referred to a committee controlled by ring influences. This is the safe method—it allows the use of unsuspecting agents, the only essential points being certain clauses in the bill, and its reference to the "proper" committee. It is remarkable how deliberately *such* a committee deals with *such* a bill; it must be properly advertised and there must be time for the companies and interests affected by it to come to a paying realization of the issue involved.

In this case one of the interests opened negotiations. Progress was made, and one of the officials took control of the final settlement. He invited the ring to an interview in a proper place, and brought the whole matter to a strictly business basis. Definite offers were made and accepted; at such a price the bill was to be killed in committee. But —— As the interview approached its prosperous close a door was suddenly thrown open discovering, in the next room, two shorthand reporters. "The conversation, gentlemen, has been accurately taken down, and will be published in to-morrow morning's journals in all its details."

You spoke in your article of taking off the roof of a state house; no doubt there was force enough in the above situation to effect such a result, but it was not necessary. Bad as the case appears, it involved, after all, a very small ring of men whose freedom and occupation were now in the most awful danger. There was nothing they were not ready to promise or to do. The situation was dramatic in the extreme and illustrated a phase of what you have termed occultism in the most striking way. For, of course, the sponge was drawn over the slate, and all was arranged to be as though it had not been.

But what lacked it all, except courage to complete and not merely to threaten? I have no doubt you have well described what would have followed the exposure. But does it seem necessary to wait a thousand years before we find a railroad official with enough steady, honest courage to complete such a job?

A PRACTICAL SOCIOLOGIST.

The Accuracy of Valve Gears.

INSEÏN, Lower Burma, Aug. 1, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is a common remark of inventors and their friends in describing the claims of new valve gears to say that they are mathematically correct, or that they give an excellent or nearly perfect distribution of steam. Mr. David Joy made such a claim in first describing his radial valve gear (see Proceedings Inst. Mech. Engineers, 1880, p. 425). He made a similar claim in his recent paper on his new hydrostatic single eccentric gear before one of the engineering societies, as reported in your journal some two years ago. Regarding this later gear he particularly mentioned, as a proof of its excellent accuracy, that the beat of the exhaust was beautifully regular, not at all like the irregular beat characterizing the common double eccentric and expansion link gear.

Alexander Morton in his paper of 1882, before the Glasgow Society of Engineers, describing his radial gear (p. 8) claims that "*the motion of the slide valve is mathematically alike in amount.*" Arrol and Pringle in their British patent No. 13,710, of 1885, for a single eccentric gear, which I have lately been studying, make a similar assertion that their gear is mathematically correct.

Now, what do such assertions and claims mean? Any one who has studied valve gears by Zeuner's polar-circle diagram and equations knows well that for all gears controlled by any form of circular motion from the engine driving-shaft the travel of the slide valve from its mid-position is a function of the angle of the revolution of the crank, that is to say, neglecting the "*missing quantity*" and errors due to local disturbances of the gear by its various movements, the slide valve opens, suppresses, exhausts, compresses and opens again at equal angles on the crank path from either dead point, *not at equal points in the piston stroke.* From the Zeuner standpoint, therefore, only a crank-path equality of angles can be termed mathematically correct. Of all the various valve-gears invented, Arrol and Pringle's single sliding-eccentric gear alone gives an absolutely true polar-circle diagram, every stage of the valve movements being at equal angles on the crank-path from either dead point, and to use Zeuner's term, there is no "missing quantity."

Designers of valve gear, however, never desire this sort of regularity. Their aim always is to produce equality of cut-off in the cylinder, tempered with a slight excess on the instroke sufficient to recoup loss of piston-rod area, or in vertical engines a slight excess on the lower side of the piston to partially balance its weight. Owing to the angularity of the connecting rod the piston always travels farther on the outstroke than on the instroke for the same angle on the crank-path. Hence any valve gear deriving its motion from the driving shaft will give a later cut-off on the outstroke than the instroke, unless it be specially adjusted to avoid this: in other words to get equal work done on both sides of the piston every endeavor is made to prevent such gears from acting with "*mathematical correctness.*" Designers of locomotive valve gear while aiming at tempered equal cut-offs on the stroke do certainly try to get the exhausts at equal angles on the crank-path, but this is for a wholly different reason, namely to get a regular beat of the blast, as it is found that an irregular beat does not produce so good a smoke-box vacuum, and needlessly tears the fire about. As the crank in a locomotive revolves at a constant speed, it is clear that to get a regular beat exhausts at equal crank-angles are necessary.

To get the cut-offs equalized and tempered on the two strokes, all sorts of expedients are adopted for "doctoring" the gear, advantage being taken of local disturbances in the gear to set one off against the other, so as to produce the desired result. In link-motion work the moral maxim that two wrongs never make a right does not hold good. With this object the position of the reversing shaft is shifted about; suspension links are made to swing awry, eccentric rods are made of unequal lengths and unequal angles of advance given to the eccentrics. Probably the easiest and most fruitful doctoring is got by employing a rocking-shaft to drive the valve. By giving it a suitable location the cut-off can be readily tempered as desired, and with equally good results for both fore and back gear. I am convinced that this useful property of the rocking-shaft explains its universal use on locomotives in America where with steam chests on top of the cylinders radial gears have made absolutely no way at all.

During the past quarter of a century I suppose I have read every book published in the English language treating of link motions and valve gears generally, and nothing has impressed me more than how that nearly all of them ignore the desirability or necessity for this doctoring of the gear and devote pages of useless calculations and diagrams to proving the correct position of the reversing shaft, length of reversing arms, drag links, etc. Zeuner set the example of this pernicious theorizing, but the professors generally have run greedily after him. It is safe, however, to say that not a single gear has ever been executed where engineers have adopted the theoretical proportions and locations for the various parts recommended by these excellent people.

On the other hand, I do not say that engineers are necessarily right in their insistence on the need for equalized cut-offs in the cylinder, and all the dodging and doctoring of the gear which this entails. None, however, of the professors has had the courage to dispute this. Will some of them now consider the matter and inform us exactly what is the gain in efficiency from securing cut-offs in the cylinder equalized on the stroke of the piston rather than on the crank-path? In other words, why should the work done on the two strokes of the piston be equal rather than that done through the two halves of the crank-path?

To clear the ground I may point out that without the dodging and doctoring referred to, all valve gears wholly operated by eccentrics or return cranks actuated by the driving shaft tend, when laid down in their simplest and most theoretically dictated forms, to give valve movements equalized on the crank-path. All single and double eccentric link motion gears come in this class. All radial valve gears where the port opening movement is obtained by a return crank or eccentric (such as Von Heusinger's gear, several forms of Morton's gear and one form of Joy's gear) also tend to give valve movements equalized on the crank-path and form one class with the above. Only those radial gears where the port opening movement is obtained from the to and fro motion of the crosshead tend (so far as local disturbances of the gear may permit) to give valve movements equalized on the stroke of piston. The marine form of Morton's gear and a few other lesser known gears of similar class fulfil this condition. These forms of radial gear where the port opening movement is obtained from the to and fro motion of the same point in the connecting rod which by its vibratory motion gives the lead of valve (such as Joys best known form of gear), lie midway in performance between the two classes above named. The nearer the point taken in connecting-rod is to the crosshead the nearer they approach the second class, and *vice versa.* Will any of your readers now say which of the two classes, undoctored, is the better?

In conclusion, while on this subject, I may draw attention to the very common, not to say general, assertion (often assumption) made by all sorts of writers, that radial gears are superior to link motions in giving a later exhaust with less compression. Joy asserted this of his gear, claiming that he could work in marine engines with a single slide valve only, where before, with link gear, a separate expansion valve was necessary (see Proc. Inst. Mech. Engrs., 1880, p. 428). Such a claim is not according to fact. No greater improvement in that respect is obtainable by employing a radial gear than by employing a link gear properly proportioned and sufficiently doctored. From experiments with full-sized model boards, with two different gears operated together, I can assert that for all practical purposes radial gears and link gears, designed for the same engine, with same lap and tend, act identically, and the valves operated by both move synchronously.

DIGNA SEQUMAUR.

Some Underground Conduit Systems for Electric Roads.

Many systems for supplying current to underground trolleys for the operation of electric roads have been devised, but only three or four have been successfully operated commercially. The very well-known line in use at Buda-Pesth, built on the Siemens-Halske system, has proved quite successful. During its daily operations since 1889 interruptions have been infrequent and dividends have been regularly paid. This system has a favorable climate to work in, but this is not the sole reason for its success, since a conduit used in England, at Blackpool, has been quite successfully operated since its construction in 1885 in a very damp climate. It is not likely, either, that the climate of England is so greatly superior to our own that the complete success of this road has depended upon it. Further, two roads in this country, built upon the Love system, have been operated, the one in Chicago and the other in Washington, although the former did not prove a complete success. In addition to these we have the new Lenox avenue line, in New York.

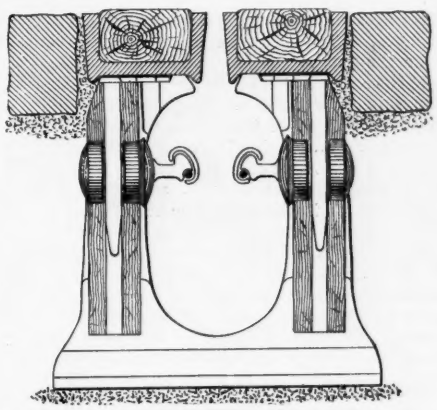


Fig. 1.—The Blackpool Conduit.

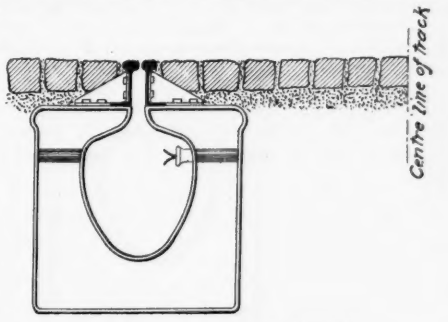


Fig. 2.—The Buda-Pesth Conduit.

One of the principal causes which lead to the lack of confidence in conduit roads arose from the repeated failure of roads of the Bentley-Knight type. A road built on this system in Boston, five miles long, failed completely after a single year of operation, due both to unfavorable climatic conditions and poor construction. While, however, such conditions did cause the failure of the Bentley-Knight conduit, it does not necessarily follow that this would have been the case with any conduit. The voltage used in this system, 500, was in the first place too high. The conduit itself was small, and the conductors were poorly protected from the weather. The

high voltage, joined with other causes, produced excessive leaking, and the result was constant interruption of traffic.

The most successful conduit system hitherto in operation, that at Buda-Pesth, is unique in that a double rail is employed to form the slot. Two rails are placed $1\frac{5}{8}$ in. apart on one side and below the slot thus formed is placed the conduit. It is small, being only 10 in. deep, but it is large enough for this particular case, as experience has proven. It is of concrete, oval in form, and 11 in. wide. The insulators are supported on cast-iron yokes placed every 4 ft., and support the working conductors, which are angle irons. They are well protected from rain and are placed near the upper part of the conduit. Proper provision is made for drainage by means of settling boxes. This system has succeeded because a low voltage (300) is used, because the conduit protects the conductors and is properly drained and because, although the conduit is small, the climate is not so severe as to require a larger one.

The points chiefly to be desired in an electric underground conduit are proper drainage, low voltage, and consequently small losses, a large conduit, proper protection for the wires and complete and accessible insulation. These requirements are practically all attainable by the proper construction of the conduit, although the expense necessary to secure them often causes the construction of cheaper systems, whose failure is a consequence of poor work.

The last requirement is a difficult one to fulfill. Currents of 500 volts are difficult to properly insulate, when we remember how easy it is for ice, snow, mud, dirt, rain, etc., to find its way into the conduit; and even when lower pressures are used, as in fact many think they should be, it is necessary to exercise the greatest care in construction in order that short circuiting and leaking may not occur. This is why a large conduit is desirable. It provides good drainage, and that is an all important feature.

The operation of such roads as the Lenox Avenue branch of the Metropolitan Traction Co., in New York City, the Rock Creek Electric Railway Co., of Washington, D. C., or the Wheless contact plate system as used in Washington and in the yards of the Westinghouse Electric Co., at East Pittsburgh, will afford valuable data for the future construction of such roads while a study of the construction of the Love conduit as used on Tenth avenue, New York, or the Connett system on the Ninth street branch of the Metropolitan Railroad Co., Washington, D. C., should give valuable lessons in the design of the latest type of conduit road now being built.

The Metropolitan Traction Co. adopted the underground system on its Lenox avenue branch, because the many curves on the line made a cable road undesirable, and they could not use the overhead trolley because of existing laws. The construction of this line, which is described in the *Railroad Gazette* for July 5, 1895, is novel, being on a design practically the same as that employed for the cable system. This makes it possible to use the road as a cable road, should the failure of the electric system make this necessary. Fig. 2 shows a section of the conduit as built. As will be seen, it is large, and is entered by manholes every 30 ft. The channel bar conductors are suspended from the roof every 15 ft., the end insulators being placed in the manholes, and the center ones having handholes provided for their ready examination. The arrangement of drains is particularly good, and every provision is taken against accident. Every 12th manhole is connected with the power-house by telephone, and quick break switches are located at intervals to cut out any section of the line in case of trouble. For a short part of the line, insulators composed of columns of soapstone, 8 in. square and $13\frac{1}{2}$ in. high are used at manholes.

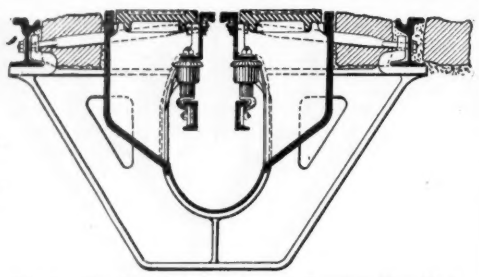


Fig. 3.—Section of Lenox Avenue Conduit, New York.

The conditions which we have enumerated for a successful conduit have been adhered to closely in this case. The provision for drainage by means of the manholes, the sheltering of the conductors, the complete and accessible method of insulating, the large conduit and the low voltage, all indicate a successful form of construction. The trolley employed is simple in design and efficient. Contact is made with the two channel bars by means of springs which press the contact shoes firmly against them. These shoes are carried upon a thin, flat steel plate, passing up through the slot, and secured to the bottom of the car.

The success of this system is not as yet a matter of certainty. It is true that it is now being successfully operated, but the real test of its value will come in the winter, when the chances for its being blocked, for leakage, etc., are greatly increased. The provisions against such stoppage, however, are superior to any which we have seen in similar roads, the fact of the size of the conduit and the low voltage (300 volts) being almost sufficient guarantee of success. The road, however, has cost at the lowest as much as a cable road, and does not offer a solution of the street railroad problem unless it can be much more cheaply constructed.

The Love conduit, which in an improved form is now being laid on Tenth avenue, New York City, from 186th street to 194th street, by the Third Avenue Railway Company, is shown in Fig. 3. It differs from the line built on this system and now in operation in Washington, particularly in the conductors, the latter being shallow copper bars instead of a copper wire. This provides a larger surface of contact. These conductors are supported from the roof of the conduit, as shown, and have an advantage over the 5-in. channel bar conductors used in the Lenox avenue line, in that they do not reach down into the conduit nearly so far, which makes the conduit practically that much deeper and less likely to fill up to the level of the conductors with snow or water. The conduit is so free from obstructions that it could easily be cleaned by brushes on each car if desired. Maj. G. W. McNulty, who is in charge of the engineering department of the Love Electric Traction Co., says that he considers the failure of such a conduit on account of bad weather practically impossible. The reason for conduit road failures in this country, he says, has been due much more to bad construction and design than bad climate.

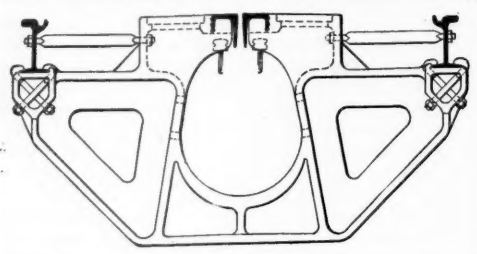


Fig. 5.—Love Conduit, Tenth Avenue, New York.

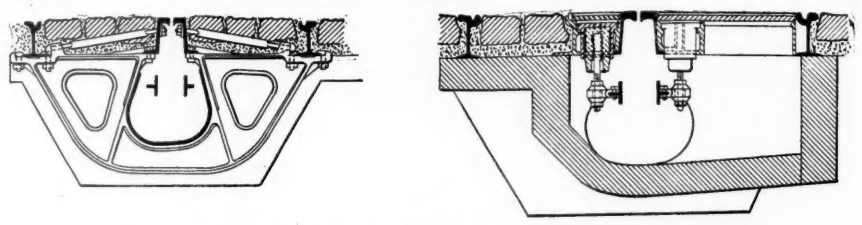


Fig. 4.—Connett Conduit—Metropolitan Railroad Company, Washington, D. C.

The Tenth avenue line differs from that on Lenox avenue, in that it was constructed as an electric road from the outset, without provision for its use as a cable road. Instead of the usual manholes every 30 ft., these are placed about 100 ft. apart, rendering the construction a little cheaper. It is also cheaper on curves, where, of course, guide pulleys are not necessary. However, the line comes very near the cable road in cost. Cast-iron yokes similar to those for cable roads are used, spaced $4\frac{1}{2}$ ft., c. to c., and placed on 6 in. of concrete. The conduit is lined with cast-iron, and the copper conductors are in lengths of $14\frac{1}{2}$ ft., each length overlapping the next one 6 in. and forming with it an expansion joint. Insulators are located at the joints only. They are movable in the direction of the line, a modification of the Washington system. These insulators are each protected by a drip shield and are reached through a handhole in the yoke, being thus readily accessible. The insulating material is an asbestos compound. Pits are provided at intervals with cut out switches to isolate portions of the line in case of accident. The construction of the road is excellent throughout, and while it is intended to use a voltage of 500, the insulation has been so carefully designed and well constructed, that no unfavorable results are anticipated on that account. We still continue to believe, however, that 300 volts is better for such work than 500.

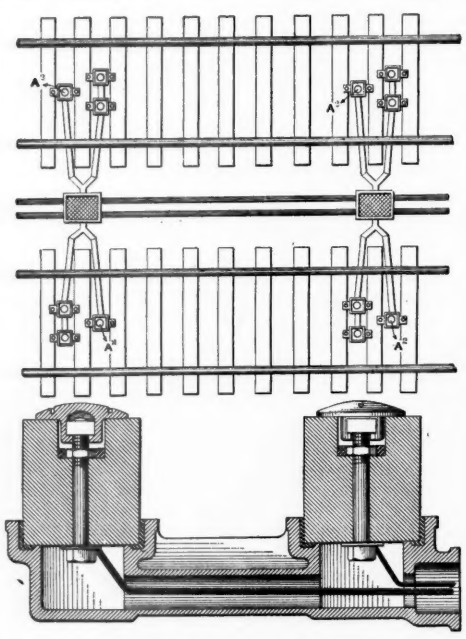


Fig. 6.—Track Plan and Contact Pins, Wheless System.

The Connett system of underground conduit, shown in Fig. 4, was designed by A. N. Connett, of Washington, D. C., and has, as we have said, been very recently placed on the Ninth street branch of the Metropolitan Railroad Company of that city. It is constructed in the same way as a cable road, with cast-iron yokes and a Portland cement conduit. Porcelain insulators are used, placed in manholes every $13\frac{1}{2}$ ft. They are entirely independent of the yokes, and are held in an iron cap, supported by the manhole cover. Their size is 4 in. diameter and $7\frac{1}{2}$ in. deep. They support in turn a rod cemented into them, from which rod the T-rail conductor is suspended by means of malleable iron clips as shown in the engraving. The conductor rail is of mild steel, weighing nearly 24 lbs. per yard, and has a capacity equal to that of 300,000 circular mills of copper wire.

The malleable iron clips just mentioned allow of adjustment of the conductor rail in a lateral direction, adjustment longitudinally being secured by moving the seat of the insulator. One of the T-rails is used for the positive, the other for the negative current, the street rails being unbonded. The bond of the conductors is double for half the road and single for the remainder.

The method of drainage in this system is carefully worked out. Drainage is made from the conduits to the manholes and from the latter to the sewers, the latter connection being made about every 400 ft. The construction of this road has cost over $35,000 per mile of single track.

For the feeders, lead covered cables of 500,000 and 1,000,000 C. M. are used. The line is cut at F street, dividing it into two parts, and each track north and south is made a separate circuit, there being thus four in all. Above F street the feeders are tapped about every 800 ft., but below the conductor rails alone are used.

The Wheless system, which we described in the *Railroad Gazette* for July 26, 1895, differs entirely from any of the roads just described. It cannot properly be called a conduit road, in the generally accepted sense of the term, but it is an underground system which, like the others, proposes to do away with the overhead trolley. Its operation has been completely successful, both on a branch of the Eckington & Soldiers' Home Railroad in Washington, and at East Pittsburgh, in the yards of the Westinghouse Electric Co. Its cost in Washington was about $35,000 per mile of double track. This is remarkably cheap, and the road seems to do all that its promoters claim for it. Its opponents hint that a large force of workmen is necessary to keep clean the metal contact plates, placed every 15 ft. in the street between the rails. They also seem doubtful that the many contact-making magnets can be made to operate without careful and frequent inspection. There seem to be no grounds for such belief since both lines now in operation are and have been successful from the start. There are some wonderfully good points about the Wheless system, and we should like to see it tried on a more extensive scale. The system of tapping the feeders to the contact plates in the track is such that the joints of junction are readily accessible, while the boxes in which the contact magnets are placed every 15 ft. are waterproof and free from any trouble on account of the bad weather. The collection of ice on the plates seems to be the most likely cause for failure, but this has not been noticed at Washington, possibly because of the milder winters. According to those interested in the system, the contact shoes on the bottom of the car are sufficiently rigid to scrape off any ice or snow that may form on the contact plates. In the newer system these plates have been replaced by round headed pins, two being used for the positive, and the third for the return current.

Many persons seem to believe that the construction of such roads as that on Lenox avenue, to replace trolley roads, will follow as a matter of course, after conduit roads have been proved successes. This is not by any means true. The conduit road, as now built, requires such care in its construction and is so expensive to build, that it cannot successfully compete with the overhead trolley. The latter, consequently, will be likely to remain on the streets of towns and cities until it is ousted by the public authorities.

The Railroad Race from London to Aberdeen.

BY J. PEARSON PATTINSON.

Considerable interest having been excited in America by the recent magnificent locomotive record performances between London and Aberdeen by the two competing routes (the West Coast and East Coast), I propose

in the following notes to give as much information about the work done as possible, and, to avoid discursiveness, have arranged my data in the brief form shown below:

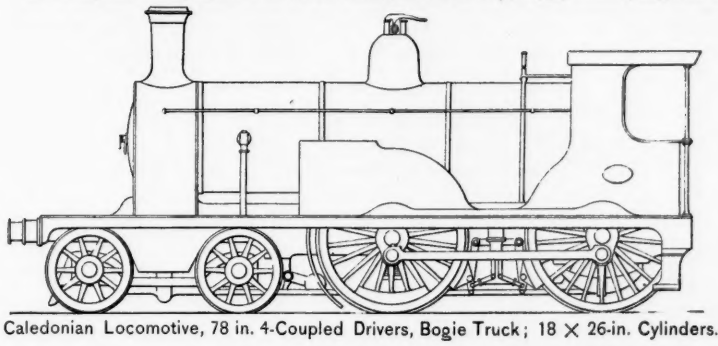
(*a*) *Companies Engaged.*—On West Coast, London & North Western to Carlisle (299¼ miles), and Caledonian beyond. On East Coast, Great Northern to York (188), North Eastern from York to Edinburgh (204½), and North British thence to Aberdeen.

(*b*) *Distance.*—540 miles by West Coast, 523 by East Coast.

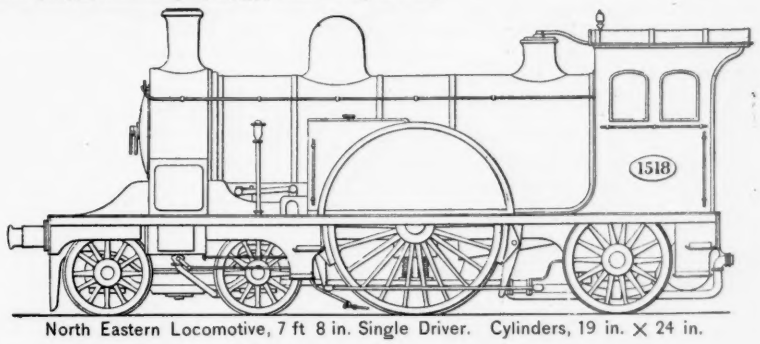
(*c*) *Stopping points.*—Crewe (158 miles), Carlisle (299¼), Stirling (417), Perth (449¼), and, except toward the end of the race, Forfar (482½), on West Coast. Grantham (105¼), York (188), Newcastle (268¼), Edinburgh (392½), Dundee (451¾), and, except during last days of the race, Arbroath (468¾), on East Coast.

(*d*) *Gradients and other Obstacles en route.*

(1) *Gradients.*—On West Coast, besides long banks of 1 in 330 and others of 1 in 200, there are formidable inclines of 13 miles averaging 1 in 120 at Grayrigg, 5 miles of 1 in 75 at Shap, 10 miles averaging 1 in 78 at Beattock and 6 miles of 1 in 90 at Kinbuck. On the East Coast, long stretches here and there of 1 in 200, but gradients otherwise nearly all easy.



Caledonian Locomotive, 78 in. 4-Coupled Drivers, Bogie Truck; 18 × 26-in. Cylinders.



North Eastern Locomotive, 7 ft 8 in. Single Driver. Cylinders, 19 in. × 24 in.

(2) *Curves.*—On West Coast sharp curves few in number. On East Coast several requiring slight diminution of speed.

(3) *Single Line.*—On West Coast, none. On East Coast, 16 miles after Arbroath.

(*e*) *Relative Difficulty of the Routes Compared.*—For such light trains the heavy West Coast grades would not be so troublesome as if the trains had been heavy; therefore we may set West Coast grades against East Coast curves and single line. But West Coast extra distance of 17 miles, see (*b*), probably means that, with equal loads, that route is about 15 minutes harder.

(*f*) *Loads Conveyed.*—Varied considerably during the racing period. Loads for last four trips when the racing was at its height are given below, see (*k*). Before that the West Coast often ran their train with one engine throughout, and 112 tons behind; but on nearly as many days the load was 175 tons, and even then only one engine was used, except over the Shap & Beattock banks of 1 in 75 and 80, as was also the case on the two days when the West Coast load was heaviest, viz. 195 and 207 tons, exclusive of engine and tender.

East Coast load was frequently about 130 tons, but, by additions en route, was often 150 and even up to 210 tons before Aberdeen was reached. With these latter loads

(*k*) *Logs of the Best Trips, Including World's Record.*

Great care has been taken in collecting the figures composing the tables below. Those acquainted with railway work will at once see that the locomotive work was of the highest order.

MONDAY, AUGUST 19, 1895.

WEST COAST TRAIN.

Miles.	Stations.	Actual Time. P. M.	Speed Miles Per Hour.	Remarks.
	Euston.....dep.	8.00		Engine 1309, Adriatic. (Webb 7 ft. Compound.)
158	Crewe.....arr.	10.37	60.37	
	" .....dep.	10 42		Weight of train, 120 tons.
		A. M.		
299¼	Carlisle.....arr.	1.03	60.10	
	" .....dep.	1.06		Caledonian engine 78.
417	Stirling.....arr.	3 03	60.38	
	" .....dep.	3.05		
449¼	Perth.....arr.	3.40	55.28	
	" .....dep.	3.46		Weight of train hence: 80 tons.
540	Aberdeen.....arr.	5.11½	61.52	

EAST COAST TRAIN.

Miles.	Stations.	Actual Time. P. M.	Speed Miles Per Hour.	Remarks.
	King's Cross.dep.	8 00		Engine 668 (8 ft. single).
32	Hitchin....pass.	8.35		Load: 101 tons.
58¾	Hunt'gdon.pass.	8 58½		
76¼	Peterb'r'gh pass.	9.15		
105¼	Grantham....arr.	9.46½	59.25	
	" ....dep.	9.50		Engine 775 (8 ft. single). Train was checked while entering York station.
188	York.....arr.	11 09½	62.45	
	" .....dep.	11.13		Engine 1624 (7 ft. coupled). Train lost 3½ min. by signals at Croxdale.
		A. M.		
268¼	Newcastle....arr.	12 37	57.32	
	" ....dep.	12.39½		Engine 1621 (7 ft. coupled).
392½	Edinburgh....arr.	2.45	59.40	
	" ... dep.	2.56		Engine 293.
451¾	Dundee .....arr.	4.00	55.55	
	" .....dep.	4.06		Engine 262.
468¾	Arbroath..pass.	4.29		
523	Aberdeen.....arr.	5.31	50.29	

TUESDAY, AUGUST 20, 1895.

WEST COAST TRAIN.

Miles.	Stations.	Actual Time. P. M.	Speed Miles Per Hour.	Remarks.
	Euston.. ....dep.	8 00		Engine 1309, Adriatic.
5½	Willesden..pass	8.06		Load: About 90 tons.
17¾	Watford ...pass	8.17		
158	Crewe .... .. arr.	10.34	61.56	
	" .....dep.	10.37		Engine 904, Hardwicke. (6 ft. 6 in. 4-coupled, 17 × 24 cylinders.
230¼	Lancaster..pass	11.44		
		A. M.		
262¼	Tebay .....pass	12.19		
281½	Penrith pass	12.38		
299¼	Carlisle.....arr.	12.52½	62.54	
	" .....dep.	12.56½		Caledonian engine 90.
349	Summit....pass	1.50½		
417	Stirling.....arr.	2.56	59.11	
	" .....dep.	2.58½		
449¼	Perth.....arr.	3.31½	58.62	
	" .....dep.	3.35½		Load hence: 55 tons.
502	Kinnaber. pass	4.23		
540	Aberdeen.....arr.	4.58½	62.58	

EAST COAST TRAIN.

Miles.	Stations.	Actual Time. P. M.	Speed Miles Per Hour.	Remarks.
	King's Cross.dep.	8.00		Load: 105 tons.
105¼	Grantham .. arr.	Times cannot		
	" dep.	be obtained.		
188	York.....arr.	11.08	60.00	
	" .....dep.	11.12		
		A. M.		
268¼	Newcastle....arr.	12.29½	62.13	
	" ....dep.	12.30½		
331¾	Berwick ...pass	1.38½		
392½	Edinburgh ...arr.	2.42	56.28	
	" dep.	2.44		
451¾	Dundee. .....arr.	3.44½	58.74	
	" ..... dep.	3.46		
485	Kinnaber..pass	4.26		Train was checked before Kinnaber, as the rival express had just passed. Ran on to Aberdeen with other signal checks.
523	Aberdeen.....arr.	5.11	50.29	

WEDNESDAY, AUGUST 21, 1895.

WEST COAST TRAIN.

Miles.	Stations.	Actual Time. P. M.	peed Miles Per Hour.	Remarks.
	Euston.....dep.	8.00		Load: About 100 tons.
158	Crewe .....arr.	Times cannot		
	" .....dep.	be obtained.		Engine Queen (6 ft. 6 in., 4-coupled, cylinders 17 × 24).
230¼	Lancaster..pass.	11.46		
		A. M.		
262¼	Tebay.....pass.	12.20		
281½	Penrith....pass.	12.38		
299¼	Carlisle.....arr.	12.53	61.27	
	" .....dep.	12.56		Caledonian engine, 78.
417	Stirling.....arr.	2.49	62.52	
	" .....dep.	2.53		
449¼	Perth .....arr.	3.27	56.91	
	" .....dep.	3.29		Load: About 55 tons.
502	Kinnaber..pass.	4.18		
540	Aberdeen.....arr.	4 55	63.31	

EAST COAST TRAIN.

Miles.	Stations.	Actual Time. P. M.	Speed Miles Per Hour.	Remarks.
	King's Cross..dep.	8.00		Load: 100 tons (about).
105¼	Grantham....arr.	9.41½	62.27	
	" ... dep.	9 44		
188	York.....arr.	11.01	64.48	
	" .....dep.	11.05		
210	Thirsk.....pass.	11.23		
232	Darlin'ton.pass.	11.43		
		A. M.		
268¼	Newcastle....arr.	12 25	60.19	
	" ....dep.	12.26½		
284¾	Morpeth...pass.	12 40		
335¼	Berwick...pass.	1.26		
392½	Edinburgh....arr.	2.19	66.26	
	" ....dep.	2.21		Load: 86 tons.
451¾	Dundee.....arr.	3.21	55.52	
	" ....dep.	3.23		
485	Kinnaber..pass.	4.01		
523	Aberdeen.....arr.	4.40		

THURSDAY, AUGUST 22, 1895.

Final Run by West Coast Route.—World's Record.

Miles.	Stations.	Actual Time. P. M.	Speed Miles per hour.	Remarks.
	Euston.....dep.	8 00		Load: 67 tons.
31¾	Tring.....pass.	8.33		Engine: 1309, Adriatic (compound) to Crewe.
133½	Stafford.....pass.	10.03		
158	Crewe.....arr.	10.27½	64.27	
	" .....dep.	10.30		Engine to Carlisle: 904, Hardwicke (6 ft. 6 in., 4-coupled type, cylinders 17 × 24).
209¼	Preston.....dep.	11.16		
230¼	Lancaster.....	11.35		
		A. M.		
262¼	Tebay.....	12.04		
267½	Shap Summit.....	12 10		
281½	Penrith.....	12.21		
299¼	Carlisle.....arr.	12.35½	67.50	
	" .....dep.	2.38		Caledonian engine, 90.
417	Stirling.....pass.	2.34½		
449¼	Perth.....arr.	3.07½	60.20	
	" .....dep.	3.09½		
515¾	Drumlithie.....pass.	4.09½		
540	Aberdeen.....arr.	4.32	66.00	

two engines were used, as a rule, north of Newcastle, although grades are not difficult. If not, time was often lost.

On the whole, East Coast loads *per engine*, perhaps, a trifle heavier than West Coast, but not to anything like the extent one would imagine from reading the accounts in the English engineering press which, generally in giving the number of vehicles on the rival trains, did not mention that East Coast coaches were 6 wheelers, weighing only 15½ tons. whereas those used by West Coast were 8-wheelers, and weighed 22½ tons each.

(g) Types of Locomotives Used.

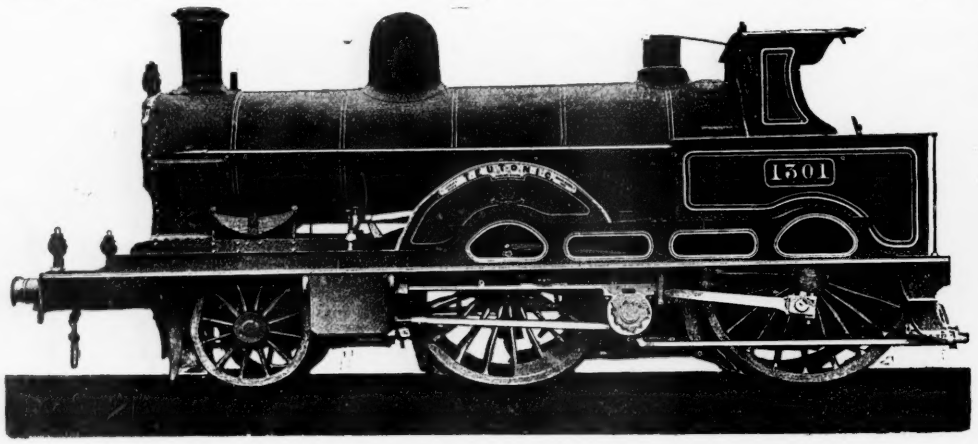
(1) *West Coast—London & North Western.*—Except occasionally during the last few days of the race, when a 7-ft. compound (see illustration) with 14 (two) and 30 × 24 cylinders was used, the L. & N. W. Company's records were done by their small 6 ft. 6 in. 4-coupled type, with cylinders only 17 × 24.

West Coast—Caledonian.—Used their 6 ft. 6 in. 4-coupled type, with bogie and 18 × 26 cylinders. (See illustration.)

(2) *East Coast—Great Northern.*—Alternated their 8 ft. singles of latest and earlier types, with respectively 19½ × 28 and 18½ × 28 outside cylinders, with their 7 ft. 6 in. type, cylinders (inside) 18½ × 26.

East Coast—North Eastern.—Used their large 7 ft. 8 in. singles (see illustration) and their very heavy (92 tons, with tender) new coupled locomotives. Cylinders respectively 19 × 24 in. and 19 × 26.

East Coast—North British.—Worked the trains with their 4-coupled engines, with 6 ft. 6 in drivers and 18 × 26 cylinders.



London & North Western Locomotive; Compound. 7-ft. 4-Coupled Drivers. Cylinders, Two High-Pressure, 14 in. × 30 in.; One Low-Pressure, 24 in. × 30 in.

(h) Actual Arrivals at Aberdeen:

	Arrival Times at Aberdeen.	
	West Coast.	East Coast.
July 29	6. 5	6 23
July 30	5.59	6.40
July 31	6.16	6 50
Aug. 1	6.16	6 54
Aug. 2	6.15	6.33
Aug. 4	6. 9	7. 5
Aug. 5	6. 8	6.25
Aug. 6	6.18	6.42
Aug. 7	6 15	6.28
Aug. 8	6.17	6.50
Aug. 9	6. 9	6.45
Aug. 11	6.11	6 30
Aug. 12	6.12	6.20
Aug. 13	6.15	6.28
Aug. 14	6.13	6 22
Aug. 15	6.18	6.25
Aug. 16	6.10	6 27
Aug. 18	6.23	6.37
Aug. 19	5.15	5.31
Aug. 20	4.58	5 11
Aug. 21	4 51	4.41
Aug. 22	4.32	6.23

West Coast arrived 20 times first; East Coast twice only. West Coast on three occasions covered the whole distance between London and Aberdeen at or over 60 miles an hour *including stops*, East Coast once only. The only other occasion on which a distance approximately so long was covered at about the same speed was the experimental run from New York to East Buffalo in September, 1891, when the 436½ miles took 425½ minutes *excluding*, or 439¾ minutes, *including stops*.

(*i*) *Notable Records.*—The following trips are extremely noteworty, those from Crewe to Carlisle (141¼ miles) in 125½ minutes, and from Newcastle to Edinburgh (124¼ miles) in 112½ minutes, being probably unprecedented.

(1) Crewe to Carlisle in 125½ minutes on Aug. 22. The last 69 miles of this was covered in 60½ minutes, and comprises the ascent of the Grayrigg and Shap banks, 13 miles, averaging 1 in 120, and 5 miles of 1 in 75. Engine Hardwick and 67 tons. L. & N. W. Ry.

(2) Newcastle to Edinburgh in 112½ minutes on Aug. 21. Load about 100 tons. This stretch includes several miles of about 1 in 200, and a slack round the curve before Berwick. N. E. Ry.

(3) Carlisle to Stirling, 117¾ miles in 113 minutes with engine 78 and 100 tons on Aug. 21. This stretch includes about 12 miles of 1 in 200, and 10 more averaging 1 in 78 against the train. Caledonian Railway.

(4). King's Cross to Grantham (100 tons), 105¼ miles in 101½ minutes—long banks (nearly 30 miles in the aggregate) of 1 in 200 and slightly harder, and check while running through Peterboro'; (5) Euston to Crewe (67 tons), 158 miles in 147½ minutes—long banks of 1 in 330; (6) Perth to Aberdeen (67 tons), 90½ miles in 82½ minutes—rough up and down course, as well as a two-minutes' delay at Aberdeen ticket platform. (7) York to Newcastle (105 tons), 80¼ miles in 77½ minutes—including a check while running through Durham, and (8) Grantham to York (100 tons), 82¾ miles in 77 minutes, are all runs of the highest order and, together with the other runs of the last few trips while the racing was keenest, will be found collected in the following "logs" of the best trips by either route.

Some Weaknesses of State Railroad Management.

In an encyclopedic work on the political sciences now in course of publication by Kuno Frankenstein, one of the 17 volumes which are devoted to economics is a monograph on "Transportation," by Dr. R. van der Borght, Professor of Political Economy in the Technical High School at Aix-la-Chapelle. This volume of 411 royal octavo pages has sections devoted to transportation in general, to highway traffic, water transporation, railroad traffic (78 pages), and communication by mail, telegraph and telephone. In the part on railroads there is a discussion of the efficiency of state railroad management, which is interesting as coming after the experience of it which has been had in Germany now for a considerable period, on a large scale. The discussion of the propriety of state ownership is rather summary, and the decision is in its favor, which gives more weight to the criticisms of the efficiency of the actual management.

Having discussed what organizations of the body politic should undertake the construction and working of the railroads—the empire, nation, province or commune or city—the work says:

As attention was given chiefly and for a long time almost exclusively to main lines, it is easy to understand that the question as to who best can build and work railroads was narrowed down to the question whether the state railroad system or the private railroad system is preferable. By private railroads is here meant what is often overlooked—the roads of private corporations for the purpose of gain—stock companies. Bearing this in mind, the theoretical objections against the state system based on the inferior efficiency of state organizations for the conduct of railroad operation fall to the ground. For, as has been shown, it cannot be denied that the state can manage the roads as well as the great joint stock companies. The prosecution of railroad construction in quiet times, free from strong speculative movements, rational development of the system of lines, avoidance of the wasteful effects of competition, uniformity in the operating service and organization, the balancing of unprofitable by profitable lines, consideration of the economic interests of the community in making rates, and other similar matters are to be expected from a state system rather than from one of chartered companies or a mixed system. But it has already been shown that with the state system the danger of the evils of bureaucracy is undeniable, and that a narrow disposition against the toleration of private enterprises may be developed under certain circumstances, even where the state will or can do nothing itself. These are the most important dangers which may attach to a state system, but do not necessarily attach to it. In addition, there may easily befall the further danger that the profits of the railroads be applied for general government expenses, and the economic interests of the community not be sufficiently regarded.

Whether and how far these dangers are practical depends upon the circumstances in each case. Even in Prussia, with its capable and conscientious official service, with its sound financial principles, and its traditional energetic fostering of economic affairs, the state railroad system has hitherto not been able to develop its full efficiency. Although this is to be attributed in part to the novelty of the matter—so extensive an experiment in state management has never before been made—and although many complaints are unjust, still it is not to be denied that great errors are made on the Prussian state railroads, errors which have noticeably cooled down the original enthusiasm for the state system.

The charge against the Prussian State Railroads is, first of all, a lack of initiative in technical matters, too great indisposition to reduce freight rates and construct new lines, cumbrous business methods and too much red tape.

In technical matters there is scarcely a point which has not given occasion for complaint. Too light construction of the superstructure, too light rails, insufficient progress in the laying of iron sleepers, adherence to antiquated forms of rail joints, too little use of mechanical signals and safety appliances and instead the issue of long instructions to employees liable to error, failure to remove level crossings at many stations, adherence to the inconvenient and, for the employees, dangerous compartment passenger cars, the extensive use of passenger cars without water closets, the small capacity of the freight cars are among the many things found fault with. And one who reflects on these complaints must find that in fact there remains much to be desired in many points, as for example the forward fitting of the passenger cars, the size of the freight cars, the use of mechanical safety appliances, free from human errors, etc. At the same time, we cannot fail to see that many improvements have already been introduced. But the Prussian State railroad management makes slower progress in these things than seems needful and possible to the community; it often waits for the experience of foreign countries when the public hoped for the initiative from itself. Often it is fear of reducing the receipts which occasions such hesitation and delay.

The disposition of the stock of freight cars also causes many complaints. While on the one hand the cars are occupied only to a small part of their capacity and a costly system of car-accounting is enforced, periods of a car famine return almost regularly, which occasion serious injury to industries and agriculture. They occur in spite of all discussions over the expected demand for cars, and in spite of the actual increase in the stock of cars.

We cannot here inquire whether a different organization of the freight train traffic would not improve matters greatly in this particular; but it is easy to understand that under such circumstances the shippers should demand that more of the great railroad surplus earnings should be expended for increasing the car stock.

The introduction of important reductions of rates is almost uniformly met by the objection that they would cause too great a reduction in the railroad earnings, and such considerations frequently cause such movements to fail. Numerous examples can be found in every Chamber of Commerce report.

In these reports is also reflected the struggle which takes place between the community and the state railroad administration concerning extensions of the railroad system. Even lines whose economic importance is beyond doubt, to the disadvantage of the districts concerned are postponed for long periods, or altogether neglected, again for financial reasons chiefly, while on the other hand charters for such lines are refused to private companies.

Meanwhile the conduct of business between the railroad authorities and the public in matters of this kind generally consumes a great deal of time. This is especially the case in questions of rates. The district and national railroad councils also contribute to a very slow elaboration of the separate propositions, and often enough a more or less solemn burial of them, desired perhaps by the state railroad administration, but not always advantageous to the public interest.

The final causes of these unpleasant developments, which in the long run destroy the interest of the railroad men in their work and the confidence of the community in the railroad management, are the amalgamation of the Prussian Railroad accounts with the general national accounts, the manner of organization of the railroad officials, and the predominant legal training of the officials in authority, three points in which a state railroad system is especially liable to error.

As to the amalgamation of the railroad accounts with the general treasury accounts, or to speak more correctly, the use of an important part of the profits of the railroads to cover general national expenses, this does not correspond with the original declarations of the government. When the great state purchase began in Prussia, the idea standing decidedly in the foreground with the government was not to aim at surplus profits for general state expenses, but first of all to consider the general interests of traffic. This position has not been maintained, however, and here has been shown how great is the temptation, with a state railroad system, in all operations to aim at the greatest possible net profits for the state treasury. In itself, as has been shown, the aiming at profits from a state railroad, is not always to be condemned. When the railroad system is undeveloped, it may even be the only just plan, in order to make possible the more rapid completion of the system. Even when, as in Prussia, the system is so far complete as to need only the addition of a few main lines, and a more plentiful provision of branch roads, such surplus profits are justifiable, if they are used for the necessary extension of the system, the increase of the stock of cars and locomotives, improvements in superstructure, stations, signals, etc., and the more rapid reduction of the interest-bearing capital, provided that the general traffic interests are not affected by too high rates.

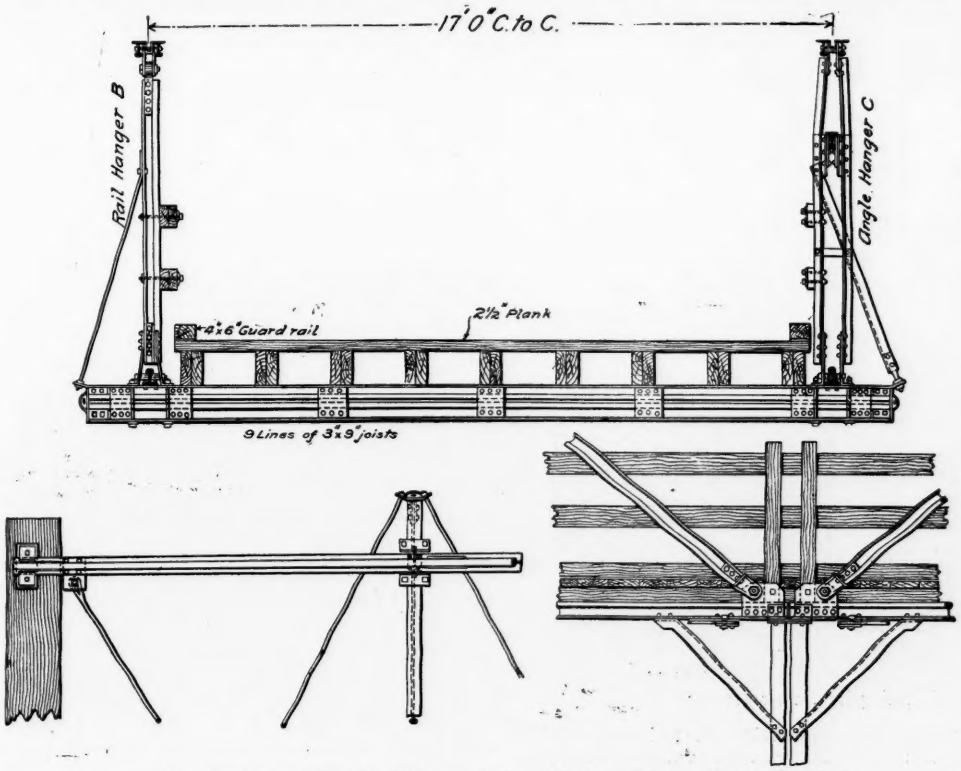
Not the surpluses in themselves, but the use of them for national expenses, which have nothing to do with transportation, must be opposed. In this way on the one hand a member is introduced into the finances of the state which yields very variable amounts, which cannot be calculated beforehand, according to the current economic conditions. On the other hand, such a proceeding may also lead the management of the state rail roads to strive anxiously not to let the profits fall off, but to increase them whenever possible. This may result to great reserve in all innovations in the operating service and in the equipment of the roads, a paltry reckoning of any possible loss of earnings in case of proposals for reductions of rates, and timidity in undertaking any considerable extensions. In times, when in harmony with the general economic situation, railroad earnings fall off, or when the general financial situation requires larger receipts, there may even be developed a system of economizing which not only leads to excessive dismissals of employees and laborers, but also to the oppression and neglect of the shippers' interests. Then, under certain circumstances, there may even be manifested an obstinate resistance to just claims for damage, etc., made by the public, by which the reputation of the state railroad management does not gain, an omission of necessary measures, or such a delay in taking them, as to endanger the operation and result eventually in losses. In a word, the interests of commerce, to foster which is the first duty of the state railroad management, by the employment of a considerable part of the railroad profits for general state expenses, may easily suffer damage. We must, therefore, advocate that the Prussian railroad surpluses may again be made free for traffic purposes. Meanwhile, it should not be forgotten that this may be done only cautiously and gradually. For when once the financial administration has become accustomed to count upon such surpluses, were they to fail it suddenly it would have to find a substitute for them in other receipts, which perhaps would have a still more harmful and unjust effect. The object, however, should not be lost sight of.

A Bridge of Old Rails—Baltimore & Ohio Railroad.

The accompanying engravings show a highway bridge of old rails, designed by Mr. J. E. Greiner, Engineer of Bridges of the Baltimore & Ohio, for using old rails economically in the construction of overhead highway

bridges. The truss, as will be seen, is a combination of a bowstring and a quadrangular truss.

The first bridges of this sort built by Mr. Greiner were somewhat different from the one illustrated herewith, the bowstring principle not being utilized in their construction. The advantage of its use is obvious. As the stress which usually occurs in the top chord of a Pratt or Howe truss increases from the abutment toward the center, the section of rail employed must be that proportioned to the greatest stress, which is that found at the center. For this reason the form of truss shown was adopted since it equalizes the stress in the top chord making it uniform throughout. The rail is thus proportioned for the stress which is the least top chord stress in an ordinary Pratt or Howe truss.

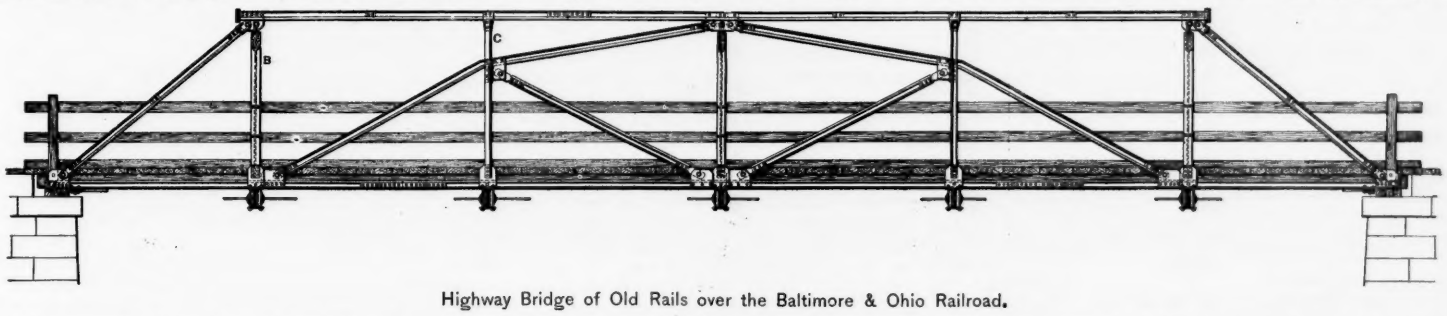


Cross-Section and Details, Baltimore & Ohio Highway Bridge of Old Rails.

The upper chord of each truss is built of two rails inverted, the bottom chord being a single rail. Bolts hold the two rails in the upper chord together, at panel points and at panel centers, cast iron separators being used to regulate their distance apart. A novel feature of the connections is the hinged pin-bearing at the ends of the inclined web members. The section through the bridge shows the design of the angle hangers as used at *C*, and the rail hangers as used at *B*. The former are made of two light angles tied together with gusset plates, connection being made with the floor beams as shown. The latter project some distance beyond the center line of the truss so as to give a support to the knee braces shown in the engraving. The floor beams are hung from the verticals by means of hanger plates and a system of lateral bracing with light rods provides for swaying stresses.

Two bridges, somewhat similar, built from designs by Mr. Greiner and described in the *Railroad Gazette* for November 30, 1894, were completed at costs of $9.18 and $8.38 per running foot respectively. These were the first two bridges of this kind built. The present type would probably cost a little more owing to the additional metal in the bowstring part of the truss.

These bridges are being generally used over the lines of the Baltimore & Ohio having been adopted by that company as standard overhead bridges. The type illustrated is used in spans from 67 to 72 ft., and is considered a very durable and economical bridge.



Highway Bridge of Old Rails over the Baltimore & Ohio Railroad.

Electric Traction on Canals.

Some time ago Frank W. Hawley, representing the Cataract General Electric Co., applied to the New York State Superintendent of Public Works for permission to experiment with a new system of towing boats on canals by electricity. It is expected that this test will be begun Sept. 25, covering a distance of four miles on the Erie Canal between Buffalo and Tonawanda, The Cooper & Hewitt cable traction system will be used and the electricity will be furnished by the Niagara Power Co. The section of the canal on which the test is to be made has several curves and overhead bridges which will test the capacity of the system in some particulars.

While awaiting the results of this experiment we may review some similar experiments which were made on the St. Denis Canal in France last year by Mr. A. de Bovet. It having been decided that no method which requires each boat to be self-propelling would be commercially successful, and the use of tugboats being prevented since locks are made just large enough to hold the canal boat alone, it was thought that the electric system would best answer the purpose, the chief requirements for economic success being to supply a barge at any point of the canal with power equivalent to two or three effective horse power and to have greater available tractive force at the locks than at other parts, even if speed be reduced.

The system is an adaptation of the trolley system. The towing apparatus, which is portable and placed in the bow of the barge, consists of a motor revolving at 1,000 revolutions per minute, driving a chain drum by means of two gears, one of which is a friction gear. Two fixed chains are laid along the bed of the canal, one for each direction of travel. The small pulley on the motor shaft which drives the counter shaft by friction and also the chain drum, are magnetized by electric coils to increase the adherence. With a chain drum 15¾ in. in diameter, making 40 turns per minute, and a chain weighing 10 lbs. per yard in contact over 180 degs., it was found that a tension of nearly one-half a ton was supported without the chain slipping.

The trolley, which is a small two-wheeled truck running on the line wire, is moved along by a cable between it and a pulley attached to the mast of the boat. Small internal brakes upon the trolley wheels prevent it from running away on inclines. The switchboard by which the speed is controlled is placed at the stern of the barge within reach of the man steering.

In the experiments in question the barge used carried 300 tons. The current was used at 110 volts and 20 amperes, but 300 volts would be used in practice. The test demonstrated that the high resistance of the chain prevented its use for the return circuit, and it was found necessary to add a second trolley wire and trolley. Within a distance of 270 ft. no trouble was experienced in reaching the normal speed of 1.8 miles per hour. Each trolley weighed about 20 lbs., but they could have been lighter. The towing apparatus weighed somewhat over 2½ tons. Its weight could also have been reduced. It was found that a continuous current was better than an alternating current, because of convenience in starting and varying the speed. Estimates made for establishing the system on a canal 31 miles long with four generating stations of 110 H. P. each, allowing 125 barges on the chain at once, showed an approximate cost of $8,000 per mile. This was for an assumed traffic of 3,360,000 tons per annum, and with this traffic the traction as described would be cheaper than horse power.

Longitudinal Bracing for Timber Trestles.*

The illustration shows the standard timber trestle used on the Norfolk & Western Railroad. It has been in use for many years, although modified of late, the size of the stringers, spur braces and longitudinals having been increased to correspond with the increased weight of rolling stock. Other changes, such as the use of a divided sill of two 6 × 12 pieces instead of one 12 × 12, have been introduced. The change just mentioned allows the parts of the sill to be replaced without either cutting off the tenons on the posts or raising the trestle bodily the depth of these tenons, as must be done when a solid sill is used and the post is mortised into it. The illustration shows a system of longitudinal bracing upon the second line of batter posts from the outside, as well as upon the plumb posts. It has been suggested that this bracing be placed on the outside line of batter posts. The advisability of such a change is the subject of this paper.

The functions of the various members of the trestle are simple and generally understood. The vertical posts carry the loads and the stringers are proportioned to the bending action of loads between the posts. Incline or batter posts are provided to resist the transverse action of the wind, etc., and in all but very low trestles face bracing on each bent is used to prevent the trestles from rocking sideways in the mortises. In trestles of much greater height the vertical and inclined legs are made in lengths of from 20 to 25 ft. It is, therefore, necessary for stability that each joint should be fixed in place by being held firmly against motion in two directions at right angles to each other. This is effected by systems of transverse and longitudinal bracing. The transverse bracing is comparatively simple, but this is not the case with the longitudinal bracing. The bracing of each set of posts, just as each bent is transversely braced, would involve the use of a great number of long and heavy timbers. By fixing a certain number of points in each

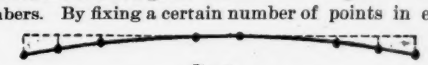


Fig. 3.

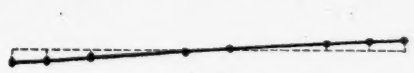


Fig. 4.

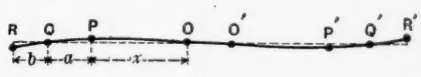


Fig. 5.

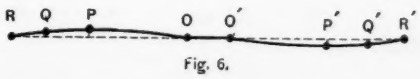


Fig. 6.

story we can, however, rely on the intermediate caps to keep the others approximately in place by depending on the stiffness of the transverse pieces against bending.

It is assumed that the plumb posts will be longitudinally braced. The present practice is to also brace the *second* line of batter posts, thus fixing the points *O*, *O'* and *Q*, *Q'*, Fig. 5, and leaving *P*, *P'* and *R*, *R'* liable to slight displacement. The change suggested is to transfer the bracing from *Q*, *Q'* to the outer line of batter posts, thus fixing the points *R*, *R'* in addition to *O*, *O'* and leaving liable to displacement *P*, *P'* and *Q*, *Q'*, Fig. 6. By giving to the various lengths between these points the letters shown in the diagrams (in which *x* changes with the height of the trestle above the story considered), and by also assuming letters for the various displacements, the calculation of these displacements for each of the points unbraced in the two cases, results in the conclusion that for all cases in which *H* (the height of the trestle above the line of caps under consideration) is less than 78 ft., including all trestles of four stories or less, the proposed change will be an improvement as judged by the criterion of the smallest displacement of the most unfavorable point.

Going a little further and considering not simply the relative amounts of such displacements, but the results thereof, we find that as soon as any given joint is thrown

* From a paper by M. E. Yeatman, Member of the Association of Engineers of Virginia, published in the Journal of the Association of Engineering Societies for April, 1895.

out of line there results a tendency for it to be forced further out, proportional to the amount of the initial displacement and also to the compressive strain on the leg in question. The horizontal resultants cause bending moments on the horizontal caps, the relative amount of which moments measure the relative danger of collapse.

In Case 1 the maximum sideways bending moment may occur either at Q or at P. Putting P, Q and R for the vertical loads at these points we next determine the bending moments at P and at Q, the values of the vertical loads P and R being determined by distributing the loads between the posts proportional to their sectional areas. This calculation results in the statement that the moment at Q or that at P is greater according as H is less or greater than 83 ft. This shows us where to find the most favorable point in Case 1. In Case 2 for all trestles of considerable height the point P will be the most unfavorable. Mr. Yeatman finishes his paper with the following conclusions:

For trestles in which H is greater than 80 ft. the proposed change would be an improvement.

In standard four-story trestles H equals 70 for the lowest line of intermediate caps; that is, the height of the three upper stories is 70 ft., the bottom one being variable. For all such trestles the change is shown to be an improvement.

For trestles of 5 stories, H would be 95 ft., and in this case the change would be for the worse so far as the bottom story is concerned, although for the better as regards the upper stories. It is necessary, however, that the bracing be continuous throughout on any line of posts which is braced in the upper stories. The following plan is therefore suggested: for all trestles of two or more stories, apply longitudinal bracing to the plumb posts and to the outside batter posts, and, in trestles of five or more stories, use an additional set of bracing on the innermost batter posts of all stories below the fourth from the top.

This improvement can be made at no additional expense in trestles up to four stories. The timber in a trestle 120 ft. high would by this change be increased from 829 ft. B. M. per lineal ft. to 849 ft., and in a trestle 150 ft. high from 1,059 ft. B. M. per lineal ft. to 1,099 ft. The increase in cost is thus shown to be small.

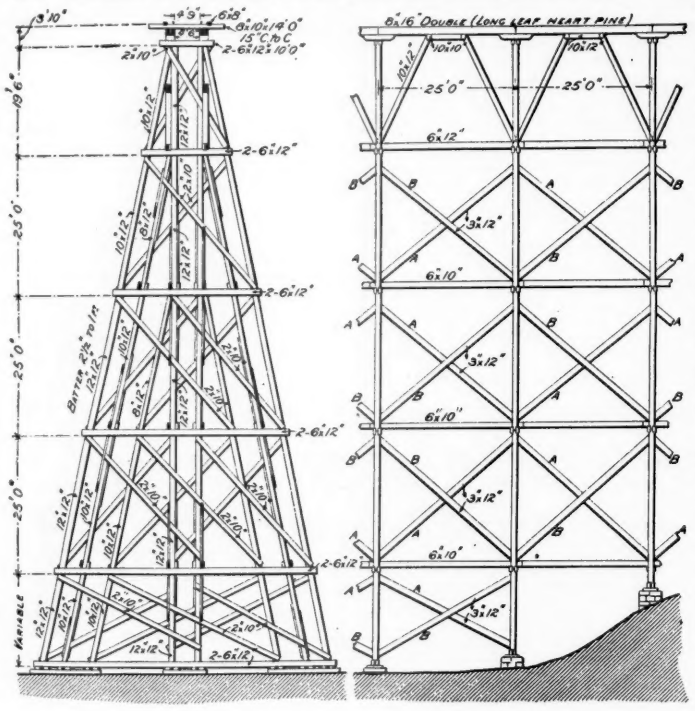


Fig. 1. *Fig. 2.*

Longitudinal Bracing for Timber Trestles.

Continuous Rails on Steam Railroads.

BY WALTER LORING WEBB, ASSOC. M. AM. SOC. C. E.

In the issue of the *Railroad Gazette* of July 27, 1894, there was printed a valuable letter from Mr. A. Torrey, Chief Engineer of the Michigan Central Railroad, embodying the results of some experiments made by him on the behavior of very long rails, which had but one place for expansion in a length of 500 ft. The rails were unconfined except by their usual attachment to the ties. The observations there referred to have been continued and many other experiments which throw considerable light on the subject have been made. Recently Mr. Torrey kindly furnished the writer with the results of the more recent experiments.

A test was made to determine the friction between the splice plates and the rail in an ordinary rail joint; an 80-lb. rail was used in the test. The method of determination was somewhat rough, but was probably sufficiently accurate for the purpose, considering that, in general, so much will depend on the pattern of rail and splice and on the stress in the splice bolts. The test showed that there was a pressure of something between 31,000 and 35,000 lbs. when slipping first took place. This means, for the 80-lb. rail, about 4,000 lbs. per square inch. This stress would be produced by a compression or tension equal to about $\frac{1}{7000}$ of the length, which might be caused by the confinement of the rail during a change of temperature of about 22 degs. As a rough figure, it may therefore be said that a change of about 22 degs. from a temperature at which there is no initial strain at the joint will be sufficient to *start* the joint.

Another very valuable set of experiments was made on the resistance of rails to longitudinal motion, i. e. the force required to make them slip on the ties and underneath the spikeheads. These experiments directly answer the question as to the extent to which the spiking of the rails to the ties, can be relied on to resist the changes of length due to changes of temperature. The following is quoted: "The rails were moved by a 20-ton hydraulic jack, with pressure gage attached. The pressure exerted by the jack was assumed to be the area of the piston multiplied by the pressure per square inch on its end. The following are the results obtained: On March 27 with 360 ft. of 80 lbs. rail with spike freshly driven, the resistance was 21,000 lbs. at first, rose quickly to 27,000 lbs. where it remained until the rail had moved about 2½ in. when it increased to a maximum of 32,000 lbs. The total movement of the rail was 3 in. On the same day, with 420 ft. of rail, having the spikes all drawn about 1 in., the resistance was 18,000 lbs. at first, and increased gradually to a maximum of 22,000 lbs. On March 29, with 210 ft. of rail with spikes, all driven two days before and untouched since, the resistance of 210 ft. of rail was 12,000 lbs., with little variation during the total movement of 1 in. The resistance of 300 ft. of rail, spikes as before, was 11,000 lbs. at first, and increased to 12,000 lbs. at the end of the movement of 1 in. The resistance of the 210 ft. and 300 ft. lengths joined together was then ascertained to be 27,000 lbs. at first, increasing gradually to 34,000 lbs. after a movement of 1 in.

"The following table shows the results in condensed form:

Length of rail.	Condition of spikes.	Total resistance.	Resistance per lin. ft.
210 ft.	Driven 2 days.	12,000 lbs.	57 lbs.
300 "	" 2 "	11,000 to 12,000 lbs.	37 to 40 lbs.
360 "	Freshly driven.	21,000 " 32,000 "	58 " 89 "
420 "	All drawn 1 in.	18,000 " 22,000 "	43 " 52 "
510 "	" driven 2 days.	27,000 " 34,000 "	53 " 67 "

"In making the 210-ft., 300-ft. and 510-ft. trials, the 210-ft. section was moved 1 in., the 300-ft. was then moved 1 in. until in contact with the 210-ft. and then the whole 510-ft. was moved 1 in. in the same direction as the previous movements."

A verification of the above figures, which were reported to Mr. Torrey by his bridge engineer, Mr. Benjamin Douglas, is given in a personal observation of Mr. Torrey that "during the moving of about 400 ft. of rail. I observed that the end of the rail, where the jack was at work, moved about an eighth of an inch before movement was induced at the other end of the 400-ft. rail."

The ⅛ in. in 400 ft. was about $\frac{1}{40000}$ of the length. A change of this amount would be induced by a stress of about 700 lbs. per square inch, or 5,600 lbs. for the 80-lb. rail. But the rail stresses in this case were maximum at the point of application of the jack and zero at the other end. If the *average* stress is 5,600 lbs., the maximum stress exerted at the jack would be double this or 11,200 lbs. This calculation uses the known modulus of elasticity of steel as the measure of force rather than the reading of the pressure gage of the hydraulic jack. The agreement with the values given in the above table ia fairly close considering the uncertainty of the observation given as "about an eighth of an inch," it not having been intended as a basis for any computation. A change of temperature of 30 degs. will produce a change of .0002 of the length, which if resisted will induce a stress of 5,600 lbs. per square inch, or 44,800 lbs. for the rail. This is greater than the force required to drag 500 ft. of rail through the spikes, as given by any of the cases in the above table, and shows that spikes cannot be relied on to hold rails 500 ft. long (and even considerably longer) against even moderate temperature changes.

The above figures, however, will throw some light on the probable action of an indefinitely continuous rail. Suppose the rail was laid at a temperature of 70 degs. and we assume (as discussed later) the limits of 20 degs. and 120 degs. At the temperature of 20 degs. there would be the tendency to contraction due to 50 degs. which would amount to 9,100 lbs. per square inch or say 72,800 lbs. for the 80-lb. rail. In the above table, leaving out the cases "freshly driven" and "all drawn 1 in." the force required per linear foot to draw the rails varied from 37 to 67 lbs. or an average of 52 lbs. At this rate 1,400 ft. of rail would furnish a resistance of 72,800 lbs. This means that if an indefinite extent of continuous rail were laid at a temperature of 70 degs. and the temperature were lowered to 20 degs. there would be induced throughout the rail a temperature strain of 72,800 lbs. If the rail were suddenly broken, a gap would be formed and there would be a general movement of the rail away from the break on both sides. This movement would probably not extend more than 1,400 feet on each side since 1,400 ft. of spiked rail would withstand the pull of 72,800 lbs. in the rail beyond. The width of the gap produced may be approximated thus: If the 1,400 ft. were free to contract to its normal length for that temperature the contraction would be about 5½ in. which occuring on *each* side of the gap would make a total gap of 11 in. But as the rail is not free, but has a tension varying from zero at the break up to the maximum of 72,800 lbs., the actual gap would probably be about one-half of this, or 5½ in. But even this would make a bad wreck a practical certainty in the case of a broken rail. During the summer, if the temperature rose to 120 degs., there would be a corresponding tendency to expansion, which would produce a corresponding compression, unless the rails yielded by buckling. If buckling occurred it would probably be in a horizontal plane; the rails could not buckle downward, and their weight together with the weight of ties and superincumbent ballast would probably prevent buckling upward. Only direct trial can determine whether the resistance to lateral motion which is induced by burying the ties in ballast would resist the tendency to buckling. Probably the larger part of the distortion produced by temperature changes would accumulate at curves, since the curvature of the track would so reduce its capacity to resist distortion.

Mr. Torrey called attention to several curious results of his experiments, which are clearly shown on the diagram (page 518, issue of July 27, 1894). He says "I have found that the rails contracted to their limit at a temperature about 20 degs. above zero and that lower temperature did not seem to contract the rail. I acknowledge that this indicates that some outside force came into action and does not at all imply that contraction ceases at the limit of temperature noted above." It is possible that a simple explanation of the above observation may be found in the increase of temperature of the rail which must result from the continual impact and wear of traffic. An inspection of the diagram referred to will show that the temperature as indicated by the thermometer imbedded in the piece of loose rail was generally much higher than the air temperature, owing probably to the direct absorption of heat of the sun, and that the real expansion of the rails was not only greater than would be expected from the temperature of the air, but even greater (generally) than would be expected from the temperature as indicated by the imbedded thermometer. This will readily explain why the rail did not contract below a length corresponding to 20 degs. even in zero weather, and that in hot weather the direct absorption of heat from the sun and also the action of traffic would cause the rail to expand even more than would be expected from the temperature as indicated by the thermometer imbedded in the loose rail.

Referring to the behavior of these 500 ft. rails, he says: "There has never been at any time anything to show that the internal pressure of the rail resulted in the least degree of buckling, either vertically or horizontally. I have sometimes found that the spikes were jammed against the rail and that the rail skewed one or more ties in its daily movement. I have not observed that this additional resistance diminished to a perceptible degree the movement of the rail thus affected."

The net result of all these experiments is expressed in the following words of Mr. Torrey: "I have come to the conclusion from the reports which I enclose and from the general conditions I have observed in the action of the long rail I have been experimenting with, that it will be entirely safe to use rails 500 ft. in length, with proper provisions for changes in length due to temperature changes, and am prepared to lay a mile in our main track thus put together."

Standard Specifications for Steel and Cast-Iron.

We have received from Mr. H. H. Campbell, of the Pennsylvania Steel Co., Steelton, Pa., who is Secretary of the Association of American Steel Manufacturers, a copy of the standard specifications adopted by that Association, Aug. 9, 1895. The Association is made up of the Illinois Steel Co., the Carnegie Steel Co., Jones & Laughlins, the Carbon Steel Co., the Cambria Iron Co., the Pennsylvania Steel Co., the Pottsville Iron and Steel Co., the Pottstown Iron Co., the Shoenberger Steel Co., Spang, Chalfant & Co., the Otis Steel Co., Limited, the Cleveland Rolling Mill Co., and some others.

STRUCTURAL STEEL.

Process of Manufacture.—1. Steel may be made by either the Open Hearth or Bessemer process.

Test Pieces.—2. All tests and inspection shall be made at place of manufacture prior to shipment.

3. The tensile strength, limit of elasticity and ductility shall be determined from a standard test piece cut from the finished material and planed, milled, or turned parallel. The elongation shall be measured on an original length of 8 in., except when the thickness of the finished material is ⅛ in. or less, in which case the elongation shall be measured in a length equal to 16 times the thickness; and except in rounds

of ⅝ in. or less in diameter, in which case the elongation shall be measured in a length equal to 8 times the diameter of section tested. Two test pieces shall be taken from each melt or blow of finished material, one for tension and one for bending.

3a. Material which is to be used without annealing or further treatment, is to be tested in the condition in which it comes from the rolls. When material is to be annealed or otherwise treated before use, the specimen representing such material is to be similarly treated before tested.

4. Every finished piece of steel shall be stamped with the blow or melt number, and steel for pins shall have the blow or melt number stamped on the ends. Rivet and lacing steel and small pieces for pin plates and stiffeners, may be shipped in bundles securely wired together, with the blow or melt number on a metal tag attached.

Finish.—5. Finished bars must be free from injurious seams, flaws or cracks and have a workmanlike finish.

Grades of Steel.—6. Steel shall be of three grades, rivet, soft and medium.

7. Rivet steel. Ultimate strength, 48,000 to 58,000 lbs. per square inch. Elastic limit, not less than one-half the ultimate strength. Elongation, 26 per cent. Bending test, 180 deg. flat on itself without fracture on outside of bent portion.

8. Soft steel. Ultimate strength, 52,000 to 62,000 lbs. per square inch. Elastic limit, not less than one half the ultimate strength. Elongation, 25 per cent. Bending test, 180 deg. flat on itself without fracture on outside of bent portion.

9. Medium Steel.—Ultimate strength, 60,000 to 70,000 lbs. per square inch. Elastic limit, not less than one-half the ultimate strength. Elongation, 22 per cent. Bending test, 180 deg. to a diameter equal to thickness of piece tested without fracture on outside of bent portion.

Pin Steel.—10. Pins made from either of the above-mentioned grades of steel shall, on specimen test pieces cut at a depth of 1 in. from surface of finished material, fill the physical requirements of the grade of steel from which it is rolled, for ultimate strength, elastic limit and bending, but the required elongation shall be decreased 5 per cent.

Eye-Bar Steel.—11. Eye-Bar material, 1½ in. and less in thickness, made of either of the above-mentioned grades of steel, shall, on test pieces cut from finished material, fill the requirements of the grade of steel from which it is rolled. For thicknesses greater than 1½ in., there will be allowed a reduction in the percentage of elongation of 1 per cent. for each ½ in. increase of thickness to a minimum of 20 per cent. for medium steel and 22 per cent. for soft steel.

Full Size Test of Steel Eye Bars.—12. Full size tests of steel eye bars shall be required to show not less than 10 per cent. elongation in the body of the bar, and tensile strength not more than 5,000 pounds below the minimum tensile strength required in the specimen tests of the grade of steel from which they are rolled. The bars will be required to break in the body, but, should a bar break in the head, but develop 10 per cent. elongation and the ultimate strength specified, it shall not be cause for rejection, provided not more than one-third of the total number of bars tested break in the head; otherwise, the entire lot will be rejected.

Variation in Weight.—13. The variation in cross-section or weight of more than 2½ per cent from that specified will be sufficient cause for rejection, except in the case of sheared plates ordered to gage, when there will be permitted an excess of weight, over that corresponding to the dimensions on the order, equal in amount to that specified in the following table.

ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES.

Thickness of plate.	Width of plate. Up to 75"	75" to 100"
¼"	10%	14%
5/16"	8%	12%
⅜"	7%	10%
7/16"	6%	8%
½"	5%	7%
9/16"	4½%	6½%
⅝"	4%	6%
over ⅝"	3½%	5%

STRUCTURAL CAST-IRON.

1. Except where chilled iron is specified, all castings shall be tough gray iron, free from injurious cold shuts or blow holes, true to pattern, and of a workmanlike finish. Sample pieces one inch square, cast from the same heat of metal in sand moulds, shall be capable of sustaining, on a clear span of 4 ft. 8 in., a central load of 500 lbs. when tested in the rough bar.

SPECIAL OPEN HEARTH PLATE AND RIVET STEEL.

Test Pieces.—1. All tests and inspection shall be made at place of manufacture prior to shipment.

2. The tensile strength, limit of elasticity and ductility, shall be determined from a standard test piece cut from the finished material and planed, milled or turned parallel. The elongation shall be measured on an original length of 8 in., except when the thickness of the finished material is ⅞ in. or less, in which case the elongation shall be measured in a length equal to 16 times the thickness; and except in rounds of ⅝ in. or less diameter, the elongation shall be measured in a length equal to eight times the diameter of the section tested. Four test pieces shall be taken from each melt of finished material; two for tension and two for bending.

2a. Material which is to be used without annealing or further treatment, is to be tested in the condition in which it comes from the rolls. When material is to be annealed or otherwise treated before use, the specimen representing such material is to be similarly treated before testing.

3. Every finished piece of steel shall be stamped with the melt number. Rivet steel may be shipped in bundles securely wired together with the melt number on a metal tag attached.

Grades of Steel.—4. Extra soft steel. Ultimate strength, 45,000 to 55,000 lbs. per square inch. Elastic limit, not less than one-half the ultimate strength. Elongation, 28 per cent. Cold and quench bends, 180 deg. flat on itself without fracture on outside of bent portion.

Fire Box Steel.—5. Ultimate strength, 52,000 to 62,000 lbs. per square inch. Elastic limit, not less than one-half the ultimate strength. Elongation, 26 per cent. Cold and quench bends, 180 deg. flat on itself, without fracture on outside of bent portion.

Flange or Boiler Steel.—6. Ultimate strength, 52,000 to 62,000 per square inch. Elastic limit, not less than one-half the ultimate strength. Elongation, 25 per cent. Cold and quench bends, 180 deg. flat on itself, without fracture on outside of bent portion.

Boiler Rivet Steel.—7. Steel for boiler rivets shall be made of the extra soft quality specified in paragraph No. 4.

The allowance for overweight for rectangular plates is the same as that given above.

For all plates ordered to gage there will be permitted an excess of weight over that corresponding to the dimensions on the order, equal in amount to that specified in the above table.

A Simple and Light Steel Piston.

The Rogers Locomotive Company, of Paterson, has been developing a light form of steel, single-plate piston for locomotives. It has now reached the form shown by the illustration and is working well in actual service. The design is intended principally for compounds but is useful on all locomotives where the service demands light reciprocating parts. This step is in the line of the reduction of the effect of counterbalances on the track and for that reason the designs are interesting. One trouble with cast-steel pistons is removed by this construction, that is, the cutting of the cylinder which sometimes occurs when the cast steel of the piston rubs on the cast iron of the cylinder. To stop this, there is a cast-iron ring *A*, which is cut at the top at *C* and opened out to pass over the lips on the piston head. It is then allowed to spring back into place and is held by the copper rivet *D*, shown in the elevation. The packing rings are held from turning by the copper plugs *B*. This is the lightest shape of cast-steel piston made so far and it has some excellent features.

Nickel Steel.

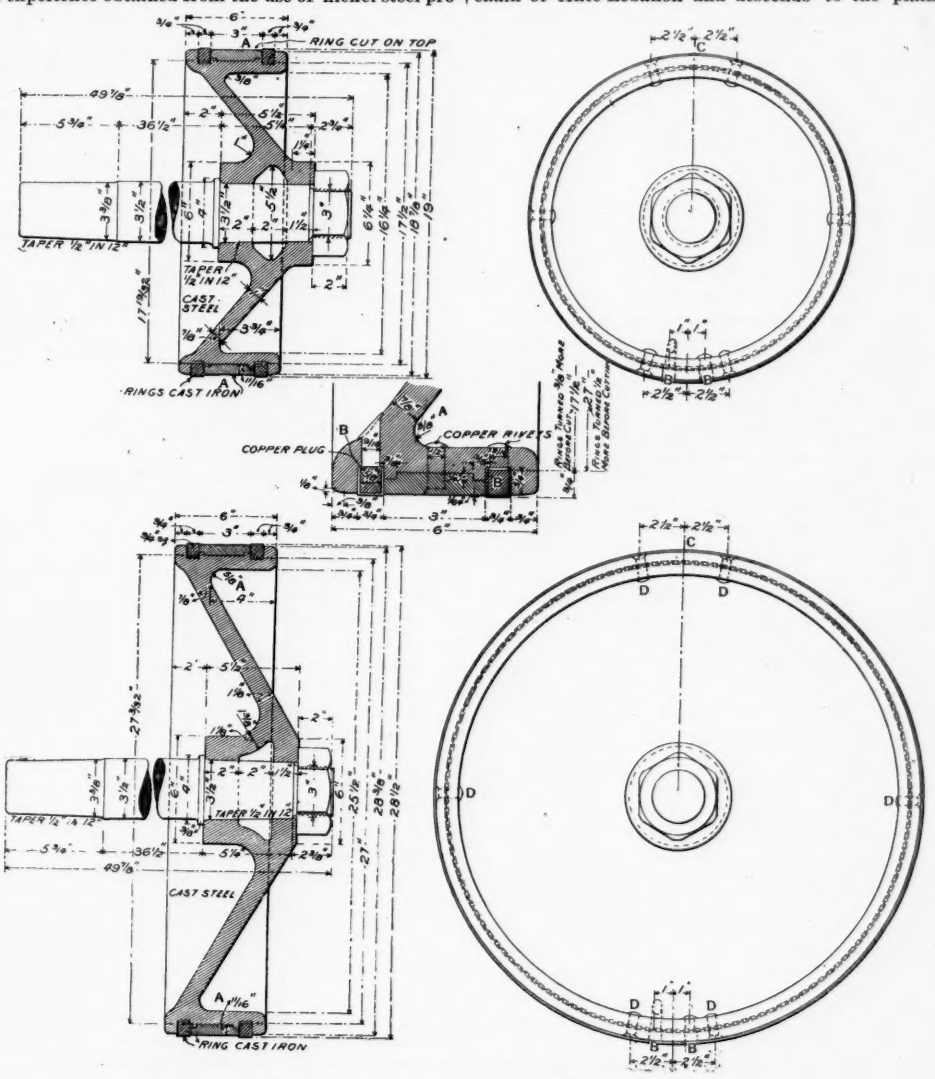
Henry A. Wiggin recently read before the Birmingham meeting of the Iron & Steel Institute of Great Britain an interesting paper on nickel steel from which we make a short abstract.

Nickel steel containing about 3¼ per cent. of nickel is now being produced with the same elongation as ordinary steel and with a tensile strength 30 per cent higher and an elastic limit at least 75 per cent. higher. It possesses great uniformity, the nickel being distributed throughout, and not liable to segregation. Its greater strength and high elastic limit should make this material particularly suited for building and structural work of all kinds. The new boilers for the United States cruiser Chicago are being made of nickel steel, and from this experiment it is hoped that valuable information will be obtained concerning the further use of nickel steel for this purpose. Some corrosion experiments have been made with specimens of steel for the purpose of determining their relative values for use in boilers and for the plating of vessels. The results of these tests are shown in the accompanying table.

PERCENTAGE OF TOTAL LOSS.

Material.	10 per cent. salt water boiling for three months.	Steam for two months.
Nickel steel.....	1.00	0.27
Bessemer steel.....	1.81	0.58
Open-hearth steel.....	1.97	0.31
Open-hearth steel.....	2.00	0.36

The tests were on a small scale, but were confirmed by the experience obtained from the use of nickel steel pro-



The Rogers Locomotive Company's Steel Piston.

pellers. The pieces tested were 1 in. × 1 in. × ¼ in., weighing about an ounce.

Experiments for flanging nickel steel plates of all thicknesses suitable for boilers prove that this material can be worked without any difficulty. It can be readily forged or pressed in dies without cracking.

If the allowed pressure in the boiler is proportional to the ultimate strength of the material a nickel steel boiler would carry a pressure 30 per cent. higher than one of ordinary steel of the same weight, and would have a longer life if the above experiments show true results. Considering the relative elastic limits of the two materials, this allowed boiler pressure would be still greater. It would seem that the increase in the steam pressure carried in modern boilers would make nickel steel peculiarly adapted to such work. It is interesting to know that with ordinary mild steel the elastic limit is about one-half the ultimate strength, while with nickel steel it is about three-fourths. An ordinary steel with the same elastic limit as nickel steel would be a very high carbon steel deficient in elongation, and which could not be worked advantageously. Drop tests of nickel steel give even better results over ordinary steel than tensile tests show. For this reason the metal is peculiarly adapted to armor plate. The metal is also being used for shafts, piston rods, bearings, propellers and heavy ordnance. For the hull plates for vessels nickel steel with an elongation of 20 per cent., a tensile strength of 85,000 lbs., and an elastic limit of over 60,000 lbs., has been obtained, which is remarkably in advance of plates of ordinary steel. The saving in weight by the use of this material is estimated to be about 600 tons in a large warship, which could be very efficiently used for coal storage and increased armament.

Mr. Kjellberg, Managing Director of the Bofors Steel & Ordnance Works, Sweden, fully confirms from his experience the fact that a suitable addition of nickel to steel is highly beneficial to the latter, causing a marked increase in elastic limit, tensile strength and elongation. At the above works about 3 per cent. nickel is added to steel containing from 0.3 to 0.4 per cent. of carbon.

In general the percentage of nickel does not affect the welding power at all and the steel may be treated like any other steel; but for the item of cost it is probable that nickel steel could be advantageously used for all purposes for which ordinary steel is now used.

During the discussion which followed this paper, Mr. James Riley spoke of his paper concerning nickel steel, written in 1889, and then said that his experience had shown him that while nickel steel was less corrodible than ordinary steel, he thought this to be true in a less degree than Mr. Wiggin had stated; also he had found great difficulty in welding the material.

Foreign Railroad Notes.

The railroad from Beyrout to Damascus, 90 miles, was opened for traffic early last June. There are 25 miles of it with grades as steep as 370 ft. per mile and curves as sharp as 400 ft. radius, on which the Abt cog-wheel system is used. The line passes the crest of the Lebanon Mountains in the Mezer Pass at a height of 4,900 ft. above sea level only 20 miles from Beyrout. It then descends about 2,300 ft. to the plateau and again climbs the opposite chain of Ante-Lebanon and descends to the plain of Damascus. This should make an interesting and not wearisome addition to the tour of the Eastern Mediterranean, which now usually closes with a journey to Jerusalem. A French company is now negotiating for the extension of this line to the Euphrates.

On June 1 last the Western Railroad of France adopted a plan by which when a person notifies the St. Lazare station in Paris of his intention to take a train to any station on the line, the company will send to his address for his trunk, take it to the station, register it for its destination, inclose the receipt (answering precisely to our check) in an envelope with the ticket for destination, and hold it at the station till the passenger applies and pays for it, which seems a very convenient method for those who can give long enough notice, and will certainly save a great deal of time now consumed by passengers in waiting for their trunks to be registered. The charge for taking the baggage to the station, the registry charge (2 cents) and any charge for extra weight (common where only 66 lbs. is allowed free), would thus all be paid at the same time as the ticket, and the passenger would not go near the baggage-room.

Recent issues of the *Journal* of the German Railroad Union have an elaborate account of the Boston street railroads, including the subway now under construction.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The last half-yearly report of the Manchester Ship Canal gives no encouragement for the stockholders, the corporation of Manchester or for any who are financially interested in the success of the undertaking. The earnings for the half-year from the canal proper was £62,610, an increase of £19,495, but the expenses increased £19,700, leaving the net receipts only £7,028, against £8,023 for the corresponding half of last year. The Bridgewater Canal gave sufficient net receipts to bring the total net up to £25,267. There was an available unexpended balance of £155,689, which, added to a banker's and general interest income of a little over £4,000, gave an available sum of £185,142. The interest charges for the half-year amounted to £160,640, leaving a balance to be carried forward to the next half-year of £24,502. It will be seen that the total net earnings fell very far short of being enough to pay the interest charges. The directors are of the opinion that the increase in traffic is now normal and will be steady. Granting this, it will be many years before the net earnings will rise to equal the interest charges, but it is quite certain that maintenance and working cost has not reached the normal limit. It is now estimated that next year the company will have to bear an additional cost of dredging, estimated at from £30,000 to £40,000 a year, which alone would sweep away the balance carried forward to the credit of income, leaving the entire interest charges of £150,000 or £160,000 to be met out of a net revenue of say £30,000. The capital stock amounts to £8,000,000. Leaving this out of consideration altogether, the latest accurate information that we have places the fixed charges on the debt at £305,000 a year. The cost of maintaining and working the canal is variously estimated. An engineer who has been thoroughly familiar with the project from the first, and with all the surrounding conditions, has expressed to us the opinion that this will amount to £200,000 a year, or about twice the ordinary estimate. Thus we see that the enterprise cannot possibly pay interest for years to come, and the stockholders must have long ago ceased to expect any returns from their investments. A very unfortunate feature of the undertaking is that a considerable amount of stock was taken by small investors in subscriptions of $50 or $100. This is another example of the fallacy, not to say the crime, of financing such great enterprises by popular subscription. The masses may make up their minds that if the capitalists who can command the services of experts to investigate and to defend their rights do not invest in any given enterprise the small investor had better keep out. There seems to be but one way out of the trouble—to let the unfortunate taxpayers of Manchester make up the deficit from working.

The enumeration of the weaknesses of state railroad management set forth by Dr. van der Borght in his work on "Transportation," a translation of which appears elsewhere, is interesting not only as the criticism of a friend of state management, but because such criticisms do not often come to light, at least in the technical German press. It would be easy, even from our standpoint, to answer many of the complaints enumerated, and it is quite possible that, after all, the Germans are as well satisfied as any people with their railroad service. It occurs to us that we have sometimes heard complaints against the railroads, more or less well founded, even as far from Germany as America. The heart of the complaint as set forth here, that the profits of the railroads are used for general state purposes, will not by any means be generally allowed to be good among German economists. The railroads are the property of the whole community, and that the profits of this property should be used for the purposes of the whole community, seems not unreasonable, especially when the most minute and far-reaching taxation (a graduated income tax applying to incomes as small as $300 a year) is necessary to cover the national expenses, and it is very much to be doubted whether it will be wise or just to make rates to cover the bare working expenses of the railroads, even after the operations of the sinking fund shall have retired the whole debt incurred by the state for the purchase or construction of the system, which will happen after no very long time in Prussia. As to the progress made on the Prussian or other state systems, it may not be very rapid, but neither was it when most of the railroads belonged to corporations, and in some of the matters complained of by Dr. van der Borght, Prussia has been the leader in continental Europe, to a certain extent following American practice, which it has studied carefully, at a time when it seems to have been little known, or at least to have had little effect in other European countries. We do not intend to take a brief for state management, however, and it is hard to see how, where all lines are under one management, there can be that variety of experience which results in the evolution of the fittest methods and appliances. In this country among the numerous managements we have experience of many ways of doing things and many contrivances, some, doubtless, frightfully bad; but we learn something from the failures, even; and the body of experience gained is greater than could be the case under a single administration, were it the best we could select.

Economics and Physical Condition.

The hard times economies, which mostly affect the physical condition of the railroad properties are in maintenance of way and maintenance of equipment. We find in the case of individual railroads, as we have occasion to examine their annual reports, that in the last year or two great savings have been made under these items; and while it is likely that some improvements in methods and materials may have been discovered by which savings may have been made without impairing the physical condition of the property, it is probable that any decrease below the normal expenditure for these items will have to be made up sooner or later. It would be interesting, therefore, to know what the saving has been since the hard times began. Unfortunately, general statistics are available only to June 30, 1894, and the statistics available for 1894 are extremely meager, being contained in the preliminary abstract of the statistical report of the Interstate Commerce Commission published two or three months ago. From this preliminary abstract we are able to get the gross quantity expended for these items, but we cannot get, except approximately, the mileage of railroads represented in the returns. The reports of individual railroad companies to June 30, 1995, are still too few to enable us to make any profitable study of them. Therefore, the best that we can do is to take the Interstate Commerce figures now, and later consider some of those individual roads whose reports itemize these expenditures.

In 1889 the expenditure on maintenance of way for the railroads of the United States amounted to about $944 a mile. In 1894 it had fallen to about $820 a mile. In 1889 this item was 22.46 per cent. of the total working expenses. In 1894 it was about 19.7 per cent. Tabulating these figures for several years we have the following results:

	M. of way per mile.	Per cent. of total op. exp.
1889	$944	22.46
1890	977	22.06
1891	953	21.0
1892	1,011	21.02
1893	995	20.45
1894	822	19.7

It will be seen that from 1889 to 1893, inclusive, the amount per mile expended on maintenance of way varied irregularly from year to year, but on the whole increased. The percentage of total operating expenses represented by this item decreased pretty steadily. From 1893 to 1894 there was a great decrease in the expenditure per mile. We should hardly suppose that when the figures for June 30, 1895, are available, it will be found that there was another such decrease; although it is not likely that the expenditure will be found to have risen; for the maintenance of way men were obliged to work with very small forces all of the last year, and the purchases of material have only recently begun to improve.

It will be observed that the decline from 1893 to 1894 was not so great in percentage of working expenses as it was in the actual amount of money spent per mile—that is, the decrease that year in all items of working expenses was very great. In fact, about 96½ million dollars were saved in the total expenses of 1894 as compared with 1893, or 13.2 per cent.

In the item of maintenance of equipment the course has been much the same as in maintenance of way, although the saving per mile operated has not been so great. This is shown in the table below:

	M. of equip. per mile.	Per cent. of total op. exp.
1889	$695	16.55
1890	729	16.48
1891	725	15.59
1892	793	16.48
1893	805	16 53
1894	649	15 5

Of course these general figures give only a rough view of the effect of the times on the physical condition of the railroads. They give no idea whatever of the amount spent in the various years for maintenance of way and maintenance of equipment and charged to capital account. The figures given here show only the course of expenditures included under working expenses.

The Chicago, Milwaukee & St. Paul Report.

The improvement in business since June, and especially the improvement in business prospects, have enabled the managers of this company to recite and the proprietors of the property to read with something like complacency the history of its last fiscal year. The Chicago companies with a large mileage west of the Mississippi have had perhaps the most trying time in their history during the past two years; and probably the art of railroad administration was never more severely tested than during this time, with a number of the gigantic systems that exist there. The signs of the times indicate that they are finally past the great difficulties and dangers that have surrounded them so long. The public and the shareholders of the companies will never sufficiently appreciate the ability and skill which have enabled their agents, the railroad managers, to weather this terrible storm. When these managers are able to show a gain in profits sufficient to yield an additional dollar per share of dividend, they receive praise and gratitude abundantly; but when they have saved the whole or a large part of the share interest from destruction, a work of incomparably greater importance and difficulty, they must be satisfied with their own consciousness of the good work done and the appreciation of the small number who know the desperate nature of the struggle that so many of them have passed through—varying in difficulty, of course, with the financial position of the company before the hard times began.

The troubles of the Chicago railroads—that is of the companies with a large mileage west of the Mississippi—year, before last was due chiefly to general causes which affected the whole country, but last year largely to local causes, the disastrous crop failures west of the Mississippi. From these last, probably no railroad suffered more than the Chicago, Milwaukee & St. Paul, with the exception of the Chicago, Burlington & Quincy, the latter the greatest of corn-carriers, the former one of the greatest of spring wheat carriers; but both great carriers of farm produce of all kinds from the territory which suffered most from bad crops last year. These bad crops came a year after a general depression of business which had greatly reduced the activity of nearly all industries, and seriously aggravated its effects. When we are told that gross earnings fell off nearly four millions (12¾ per cent.) from 1893-94 to 1894-95, it seems a terrific set back; but that does not tell the whole story by any means, for there was an even greater decrease the previous year, the gross earnings having been:

1891-92.	1892-93.	1893-94.	1894-95.
$34,048,875	$35,743,429	$31,327,951	$27,335,369

Thus, the last year's earnings were $8,400,000 (23½ per cent.) less than two years before and $6,700,000 less than three years ago. Now $8,400,000 is nearly 12 per cent. on the whole capital stock of this company, and exceeds by $800,000 the entire interest on the funded debt. How can a company suffer such losses and survive? This is the problem propounded to many of our railroad managements within the past two years, and a problem which many of them, and the Milwaukee & St. Paul managers among them, have succeeded in solving, without wholly depriving even the holders of the common stock of an income.

The losses of the last two years have been mainly in the freight traffic, the World's Fair travel of 1893 having served to keep the passenger earnings in the fiscal

year to June 30, 1894, nearly up to the previous level. The passenger earnings have been:

1891-92.	1892-93.	1893-94.	1894-95.
$7,021,435	$7,511,757	$7,311,822	$5,852,781

The decrease last year is $1,459,041 (20 per cent.) from the previous year, and $1,658,976 from 1892-93—a very notable change in a traffic not so liable as freight traffic to great fluctuations. The quantity of this traffic in millions of passenger miles has been for the last three years successively 313, 337 and 244, and the decrease is 28 per cent. from 1893-94 and 22 per cent. from the previous year, the heavier traffic of 1893 having produced smaller earnings because so much of it was carried at reduced World's Fair rates. In the nature of passenger traffic, the number of trains cannot be reduced nearly in proportion to a reduction in traffic, and the passenger train mileage on this road last year was only 3.8 per cent. less than the year before.

The chief trouble, of course, has been with the freight traffic. This has been, in millions of ton-miles:

1891-92.	1892-93.	1893-94.	1894-95.
2,392	2,506	2,078	1,765

Thus last year's decline was 313 millions of ton-miles (15 per cent.) from 1893-94, 741 millions (29½ per cent.) from 1892-93, and even 26 per cent from 1892. So great a decline on so great a system at a time when very little business could have been diverted by the opening of new lines is one of the rare events in the history of transportation, though not very rare in this territory in the last two years.

The freight train service can be adjusted pretty closely to the traffic, and what has been done with it on this road is particularly worthy of notice. The freight train mileage has been:

1891-92.	1892-93.	1893-94.	1894-95.
14,912,926	15,590,807	12,869,482	10,911,957

The reduction is 15 per cent. from 1893-84 and no less than 30 per cent. from the previous year—a tremendous change, which must have left idle a very large part of the rolling stock and made possible a large part of the astonishing decrease in working expenses.

The freight earnings have been:

1891-92.	1892-93.	1893-94.	1894-95.
$24,559,869	$25,722,001	$21,550,687	$18,978,263

Last year $2,572,000 (12 per cent.) less than in the year before, and $6,744,000 (26 per cent.) less than in 1892-93.

The downward course of average freight rates, which for many years was rapid and continuous on most Chicago railroads, has been substantially arrested on this one for some years. In cents per ton per mile they have been for 16 years:

1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
1.76	1.70	1.48	1.39	1.29	1.28	1.17	1.09

1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
1.006	1.059	0.995	1.003	1.026	1.026	1.037	1.075

The comparatively high rate last year is due to the fact that the chief falling off in freight was in the long distance traffic, which pays the lowest rates, and it is to variations in quantities of high and low-priced freight, and not to changes in the actual rates charged, that are due most of the fluctuations in average rates throughout the country. As a rule, it is the long-distance and low-rate freight that increases fastest, and so as a rule average rates fall on most railroads. A contrary influence, however, is at work precisely on the Chicago railroads. Their more easterly lines have been having a great growth of manufacturing industries, which afford a large addition to the short-distance traffic, some of which bears much more than average rates (and some much less, as a condition of their establishment in a new field).

The traffic statistics show that in spite of the decrease of 15 per cent. in *ton-miles*, there was a decrease of but 3 per cent. in tons hauled last year. But they show also a decrease of 19¼ per cent. in the *tons* of farm produce hauled. Now this falling off in farm produce was chiefly west of the Mississippi and largely west of Minnesota and Iowa, whence it is carried 400 to 800 miles to the eastern termini of the road. There was an actual increase in freight other than farm produce. The effect is seen in a reduction of the average length of haul from 192½ to 168½ miles, as well as in the great reduction in ton-mileage. The falling off in tonnage was very much greater the year before (from 13,453,349 tons in 1893 to 10,794,058 in 1894).

Having observed the course of gross earnings, we will now examine the working expenses, which have been:

1891-92.	1892-93.	1893-94.	1894-95.
$21,937,467	$23,712,943	$20,114,333	$17,043,753

If anything could be more amazing than the decrease in traffic and earnings it is this great decrease in expenses, $3,070,580 (15 per cent.), since 1893-94, and no less than $6,669,190 (24 per cent.) since 1892-93. This latter amount is equal to more than 9 per cent. on the whole capital stock, common as well as preferred. Last year's reduction from the previous year is 19¼ per cent. in maintenance expenses and 13¼ in conducting transportation, the chief part of the latter and a considerable part of the former due, doubtless, to the great reduction in train service. The reductions from 1892-93 are 36 per cent. in maintenance expenses and 24¼ in conducting transportation—$3,270,490 in the former and $2,740,318 in the latter—extraordinary achievements, it seems to us, the necessity for which now seems happily over with.

This has left the net earnings:

1891-92.	1892-93.	1893-94.	1894-95.
$12,111,408	$12,030,486	$11,213,618	$10,291,616

The decrease in these is $922,000 from 1894 and $1,739,000 from 1893, equivalent to $1.28 and $2.41 per share of stock, or to $2 and $3.78 per share of common stock, on which latter virtually the whole loss falls, for the preferred stock has received its 7 per cent. dividends regularly all through the storm. This has doubtless been a misfortune to the holders of common stock, but it is insignificant in comparison with the tremendous reduction in gross earning and the very large (too large) proportion of the capital of the company represented by the funded debt.

Annual Reports.

Chesapeake & Ohio.—The annual report of the Chesapeake & Ohio Railway for the year ending June 30, 1895, was issued within a week or two. The principal results of operation as compared with the two years preceding are shown in the table below:

	1893.	1894.	1895.
Miles worked	1,192.5	1,278 1	1,275 9
Gross earnings	$10,336,810	$9,044.108	$9,596,031
Expenses and taxes	7,132,761	6,027,128	6,464 528
Percent. of expenses	69	67	67
Net earnings	$3,204 050	$3,016,981	$3,131,503
Interest, loss on elev., etc.	2,780,290	3,002,920	3,112,797
Surplus	$423,760	$14,060	$18,706

To show a little more clearly the course of gross earnings we may consider the chief items as below:

	1893.	1894.	1895.
From passengers	$2,363.889	$2,011,377	$1,817,148
Freight	7,573 655	6,630,201	7.301,816
Other	415,210	401,860	444,050

The large decrease in passenger earnings is attributed to depressed business conditions. To find earnings so low from passengers we must go back to 1891, when they were $1,765,000. The passenger rate, as compared with last year, increased from 1.9 cents to 1.98, but the number of passengers carried fell off from 1,893,000 to 1,813,000 and the passenger miles declined from 105½ millions to 93¼ millions. The average journey fell off from 55.8 to 51.4 miles. The President, as we have said, attributes the decrease in passenger earnings to the depressed condition of the industries along the line throughout most of the year. Inasmuch as the first quarter of the preceding year included the months of the greatest World's Fair travel, we should suppose that the effect of the loss of that would also have been felt.

The earnings from freight traffic increased over the preceding year, and in fact were greater than in any former year except in 1893; still 1894 was a year of a long-continued and very effective strike among the coal miners on the lines of the property, and as coal is so great a proportion of the feight of this road, the comparison with that year is quite misleading. Even the 1893 earnings were below what ought to be the normal, therefore we are bound to consider the 1894 earnings as only moderately encouraging. The rates were very low, namely, 0.425 cent per ton per mile as compared with 0.478 in the preceding year for the average freight rate, including coal. There are very few railroads in the country, perhaps none of the large ones, that have so low an average freight rate as this. The rate per ton per mile on coal to the seaboard was only 0.293 cent, and for coal elsewhere than to the seaboard was 0.386. For freight other than coal the rate was 0.526. The property that can live with such rates must be favorably circumstanced and well managed. We find, in fact, that the average train load last year was 315 tons; the year before it was 301. For a series of years it has been as below:

	Tons.		Tons.
1890	225	1893	283
1891	263	1894	301
1892	259	1895	315

A comparison of these figures with the averages on some of the great railroads of the country will show how favorably circumstanced and how carefully managed the Chespeake & Ohio is. The figures are from Poor's Manual, and give 1894 results:

	Tons.		Tons.
United States	173	New York Centr'l	249 (270 in '93.)
Erie	237	Lake Shore	267 (276 " ")
Pennsylvania Railroad	223	Norfolk & West'n	209
Boston & Albany	130	Great Northern	228

We have frequently pointed out the fact that the road is fortunate in its ruling grades and also that a very sagacious policy has been followed out for a number of years in improving its physical condition. It is hardly necessary, therefore, for us to repeat those facts.

The ton miles in 1895 were 1,721,000,000. In the preceding year, that is, the year ending June 30, 1894, they were 1,388,000,000. In spite of this very important increase in traffic, and in spite of the much heavier average load, the freight earnings were, as we see, but slightly increased.

A table showing some of the chief elements of operating expenses is interesting. In the table below we have omitted the last three figures and put a decimal point after the millions; therefore, the quantities are in millions and decimals of millions of dollars.

	1891.	1892.	1893.	1894.	1895.
Maintenance of way	$1.439	$1.705	$1.440	$1.129	$1.196
Maintenance of equipment	1.212	1.518	1.460	1.481	1.317
Conducting transportation	2.436	3.046	3.040	2.577	2.786
General expenses and taxes	.313	.399	.413	.482	.468

It will be observed that in spite of the low rates and of the moderate increase in gross earnings, the expenditures for maintenance of way and for maintenance of equipment have been well kept up.

We are told that the number of cars has been kept good and the capacity increased. All of the new cars are standard 30-ton cars, while a large number of those destroyed were old and of light capacity. No new work is in progress on the line and it is not the present intention to undertake any.

Southern Railway Company.—The first annual report of this company is to June 30, 1895. The report now published is preliminary, and gives little more than the financial results of operation. Additional tables with details of operation will be published before the annual meeting, which takes place Oct. 22. The figures are for 4,392 miles, and the comparison includes results from the same lines and properties for the same periods of the year previous. The main results are:

	1894.	1895.	
Gross earnings	$16,643,299	$17,114,792	Inc. $471,493
Working expenses	12,345,628	12,062,854	Dec. 282,773
Net earnings	$4,297,671	$5,051,937	Inc. $754,266

The earnings from freight for the year were nearly 11 million dollars, from passengers about 4½ millions, and from mail, express and miscellaneous about 2 millions, and the increase was distributed over all the items except miscellaneous. The reduction in expenses was $417,000 in conducting transportation and $113,000 in general expenses and taxes. At the same time there was an increase of over $160,000 in maintenance of way and structures and nearly $88,000 in maintenance of equipment, leaving the net increase about $283,000. It will be judged therefore that the company has felt pretty seriously the necessity for improving the physical condition of the properties which it now controls. Indeed, almost half a million dollars was spent for new equipment and charged to capital account, including 11 locomotives and 888 cars. There are contracts still unfilled for 22 locomotives and over 1,000 cars. The company bought during the year 41,000 tons of new rail, of which 25,000 tons was 75 lb. rail and 16,000 tons 80-lb. We shall return to this report when the traffic tables are published.

Little that is definite seems to have been reported of the results of the new Russian passenger tariff, which went into effect Dec. 1 last with great reductions, especially for the longer distances, and many important modifications. It is now reported that in January, the second month of the new rates, on 28 of the railroads the number of passengers increased from 2,122,542 in 1894 to 2,266,883 in 1895, a gain of 144,341, or less than 7 per cent. As in spite of great reductions of fares the passenger earnings increased 5½ per cent., it is evident that the average length of journeys must have increased. The average fare per journey, however, was still only 60 cents. The patronage of the second-class cars has increased proportionately more than that of the third-class, the second-class rates for considerable distances being less now than the third-class fares used to be. Very great difficulty is said to have been experienced in making the passengers follow the requirements of the new system, which are novel and not altogether simple, while a very large part of the passengers are as helpless as children. The new rules provide that a passenger without a ticket or a ticket not good for the journey he is making shall pay double fare to the next station, where he must get a proper ticket. For instance, there are limited tickets, which permit the passenger to break his journey within the limit prescribed, *provided* he presents the ticket for the station agent to stamp, both when he gets off and when he resumes his journey at the intermediate station This and other regulations were too much for the average Russian passenger, and it was necessary to suspend their operation, but after five months it was attempted to put them in force again. It must be remembered that railroads are not numerous in Russia, that by far the larger part of the population never ride on one, and that, doubtless, no inconsiderable number of the passengers are on a train for the first time.

The Oregon Railway & Navigation Company seems to have been very prosperous in the hands of the Receiver, if we may trust "confidential" statements made to brokers, or coming to their ears in some way, and by them "confidentially", imparted to favored customers; and may further trust a statement of earnings and expenses which comes, strange to say, by way of Berlin! This is:

	1894-95.	1893-94.	Increase.
Gross earnings	$5,027,332	$3,825 160	$1,202,172
Expenses	3,328 495	3,179,810	148,685
Net earnings	$1,698,837	$645,350	$1,053,487

It should be remembered that interest has not been paid on the consolidated and collateral trust bonds—by far the larger part of the funded debt—since June, 1893; that until about a year ago the road was worked by the receiv-

ers of the bankrupt lessee, the Union Pacific, which reported the earnings as small and nearly absorbed by the working expenses, and, it was said, had permitted a serious depreciation in the condition of the property, and that naturally many of the bondholders had been led to believe that their securities were not worth much. For a considerable time the consolidated 5s, with two overdue coupons, were sold at 60 or a little more. The change in the prospect under the separate Receiver is something marvelous; but there are probably many of those who were bondholders at the time of his appointment who have no cause to be grateful for the "rescue" of the property. For they were not informed of the great improvement in its prospects. No public announcement was made of the earnings and expenses; and not until April of this year did the price of the consols go above 76. Evidently, if the holders had known how well the road was doing, they would have seen clearly that the default in their interest was only temporary, and they would not have parted with their bonds at any such price; and evidently the favored few who did know the condition of things were able to pick up some great bargains at the expense of ignorant and needy holders. That any such bargains were picked up, we have no means of knowing; but if not, the knowing ones were unusually neglectful of their opportunities. Under any circumstances, with the fullest information, many holders of defaulted bonds will make great sacrifices; but that they should be deprived of the information which would enable them to judge of the true value of their property is inexcusable. A good many great fortunes have been made in this country by the withholding of such information; but such practices belong properly to the dark ages of railroad administration, and no court should permit them in these times.

The second annual meeting of the National Manufacturers' Association is to be held in Chicago, Oct. 15 and 17. The authorized delegates will number about 450. Five delegates are authorized from each state, with one additional for each $5,000,000 of production from that state, this to be determined by the last census. It is expected that a very representative body will be assembled. Those who have a right to speak with authority protest that the organization will be entirely free from politics. At the same time it has an extremely strong high tariff trend, and the same authorities say that "in future the manufacturers propose to speak as a unit through organization, and if this coalition had been effected before the Wilson bill was framed we doubt if it would have carried the want, depression and woe with it that it has." With such an idea of the functions of this organization we do not quite see how it can be kept out of politics. The organization is not yet by any means established before the public as the official representative of the manufacturers of the United States. If it ever takes that position it will have to be guided with great discretion and on very broad lines, and we doubt extremely the practicability of establishing an organization which can ever be more than a union for concerted action of a few large manufacturers who happen to think pretty nearly alike on certain public questions. The present experiment is, however, an interesting one as well as ambitious, and we wish its projectors great success. The August issue of the "Big Four Industrial Series," published by the Passenger Department of the C., C., C. & St. L. Railway, contains an article on the association which has an air of official inspiration, and which probably expresses the ideas of some of the most prominent leaders in the movement as to the policy and work of this association.

In our issue of July 19, page 485, we considered in some detail the project for building a railroad from Mombasa to the Victoria Nyanza. Recently the matter has been taken up by a committee which had the advantage of the advice of Sir Alexander M. Rendel, who, with Captain Pringle, one of the officers who made the survey, seriously modified the estimates. They reduced the cost of the 657 miles of railroad from £2,240,000 to £1,755,000. This was done by reducing the gage from 3 ft. 6 in. to 3 ft., by reducing the weight of rail from 50 lbs. to 35 lbs. and by simplifying the buildings estimated on and limiting the rolling stock to the absolute requirements. On the basis of the reduced estimate, and assuming that the Government will make a considerable saving on the cost of the transportation into the country of material which must go anyway, it is now estimated that the annual loss would be only about £2,500 if the Government builds and works the road. The committee recommends that this should be done, the Government to find the capital and to build and work the road with its own officers. As we have said before, we hope that, in the interests of Africa, the railroad will be built even if the annual deficit is likely to be considerably more than is now estimated.

The crop year for the spring wheat trade closes with August 31, and the following figures show the relative trade of the several grain markets of the country, and the amount of grain received by each:

	Bushels	
	Received.	Shipped.
Minneapolis	51,317,596	6,800,050
Duluth	32,292 485	24,171,730
Chicago	13,005,323	21,974,018
New York	22.532,164	20,250,221
St. Louis	8.447,676	6,418,035
Milwaukee	7,480,321	575,320

At all these cities, except Minneapolis and Duluth, where the figures are about the same as for the preceding year, there was a tremendous falling off. This was 17,000,000 bushels in Chicago, 6,000,000 bushels in St. Louis, and 3,250,000 bushels in Milwaukee. There were ground in Minneapolis mills 9,418,225 barrels of flour, consuming, at the ratio of 4½ bushels to the barrel, over 42,000,000 bushels of grain. This was about 97,000 barrels ahead of the preceding year. Duluth and Superior mills ground 3,324,933 barrels during the year.

NEW PUBLICATIONS.

A Brief Review of Railroad History from the Earliest Period to the year 1894. By W. Hasell Wilson, Honorary Member, Am. Soc. C. E. Octavo, 53 pages. Philadelphia: Allen, Lane & Scott; 1895. Price 25 cents.

Mr. Wilson is one of the few men still living whose working lives have covered the whole period of the development of the steam railroad from its earliest beginning, and have been spent entirely in that work. He is now 84 years old, began his railroad work in 1827, when he was only 16, and is still in actual railroad service. His life has been spent on various railroads belonging to the Pennsylvania Railroad system, and he is still president of some of its minor roads. He began as a rodman on the Philadelphia & Columbia Railroad, and until about 12 years ago his work was mostly as an engineer. Such being the case he is equipped as almost no other man could be for the work which he has undertaken in the little book before us in which he has aimed to give a general view of railroad progress without much technical detail.

Mr. Wilson's plan has been to narrate briefly and with almost no comment, the principal events in the origin and building of the earliest railroads in Europe and the United States and to give the most important particulars of their construction and equipment. Naturally, he begins with a brief account of the wooden tramways laid early in the 16th century at the Newcastle collieries. He then describes the gradual change which took place in their track, bringing us up to the Stockton & Darlington Railway completed in the year 1825. A short review is given of the history of the introduction of the steam locomotive.

In the United States the first railroad, as is well known, was the Quincy Railroad, in Massachusetts, three miles long, built to transport granite. The track here was stringers resting on stone cross ties and plated with flat iron. The next railroad was the Mauch Chunk, built a year later, namely, in 1828, and designed to carry coal from the mines to the Lehigh River. This was nine miles long. The Carbondale & Honesdale Railroad, 16¼ miles long, built by the Delaware & Hudson Canal Co., was completed in 1829, and it was here that Mr. Horatio Allen made the first attempt to use the steam locomotive in the United States, all of which is a matter of well-known history. The South Carolina Railroad was incorporated in 1827, construction was begun in 1830, and was completed in 1834. This was the first railroad built in America with the express intention of operating it by steam locomotives, which plan was adopted on the recommendation of Mr. Horatio Allen, who was its chief engineer. The Baltimore & Ohio, however, which was also incorporated in 1827, was built and opened in 1830 to Ellicott's Mills, 15 miles, and in 1832 to the Point of Rocks, 73 miles from Baltimore. It was the expectation at first that this road would be worked by horse power, as was actually done, but in 1831 an engine built by Phineas Davis began to run regularly over the line and horse power was gradually discontinued.

In 1824 the legislature of the State of Pennsylvania appointed a Board of Commissioners to examine and report on a general system of transportation improvements for the state, and naturally these Commissioners looked to canals as the obvious solution. In 1825 the Commission reported that "there should be a leading, uninterrupted canal, made and owned by the Commonwealth, running the whole length of the state, so that a boat loaded at Pittsburgh could land her cargo at Philadelphia," and the construction of the canal along the Susquehanna River was actually begun July, 1826. Further study was made, however, competent engineers having been employed, and a report was made against the use of canals for the portions of the route between Philadelphia and the Susquehanna River and over the Allegheny Mountains, and the Legislature authorized the construction of two sections of railroad, one of these 81½ miles long between Philadelphia and Columbia on the Susquehanna River, and the other 36½ miles long across the Allegheny Mountains. The State Commissioners still believed that "the advocates of railroads generally overrate their comparative value, and that canals are from two to two and a half times better than railroads for the purposes required of them by Pennsylvania." Still the work on the railroads began under the State Government.

The Philadelphia & Columbia Railroad was located in the year 1828, and here Mr. Wilson began his work. In September, 1832, about 20 miles of the eastern end of the road was opened for travel, and in 1834 the entire line was completed, with two tracks, and through traffic established. All the cars, both for passenger and freight, were owned by individuals or transportation companies who furnished their own teams and paid toll to the state. Two locomotives were put on the road by the state about the end of the year 1834, and the use of animal power was gradually discontinued. The state owned the locomotives, for the use of which an additional toll was collected.

The Allegheny Portage Railroad, the other line begun at about the same time as the Philadelphia & Columbia, extended from the canal basin at Hollidaysburg on the east to another canal basin at Johnstown on the west, 36½ miles. The summit was 1,399 above the eastern basin and 1,172 above the western basin. There were five inclined planes on each side of the summit which were worked by stationary steam engines. Between these planes were short lengths of from ¼ to 13 miles on which the grades were moderate, and here horse power was used on the short levels and locomotives on the longer ones. To avoid trans-shipment canal boats were built in two or three sections, which were detached and placed on trucks to be conveyed over the railroad part of the line. In 1851 the state began building a new line to avoid these planes, with a maximum grade of 75 ft. per mile and a tunnel 2,000 ft. long at the summit. In 1857, before the work was done, the main line between Philadelphia and Pittsburgh was sold to the Pennsylvania Railroad Company. The company had previously built its own line of railroad across the mountain, and it abandoned the old and new state portages after removing materials. Visitors to Cresson can still see vestiges of this portage railroad if they will take the trouble to take a short walk along the hills. The remaining canals were sold in 1858 to incorporated companies and this ended the state's management of transportation.

The earliest locomotives used in America were brought from England, but after 1834 very few locomotives, if any, were imported, and in 1839 and 1840 William Norris, of Philadelphia, actually exported 16 locomotives to England, and within the next few years he sent abroad to England and the Continent 170 locomotives.

Mr. Wilson's little book is valuable for the pains taken to collect and to record simply and concisely some of the leading events of the first periods of our railroad history. But after all it is only a pamphlet, and very much that it contains was already in print. It will always be a matter of profound regret that he did not make it a great many times larger and put into it a great deal more of his own extraordinary personal experience.

Engineering Contracts and Specifications, including a Brief Synopsis of the Law of Contracts and Illustrative Examples of the General and Technical Clauses of Various Kinds of Engineering Specifications. By J. B. Johnson, C. E., Professor of Civil Engineering, Washington University, etc., etc. Octavo, 418 pages, with index. New York: Engineering News Publishing Company. 1895. Price $4.

The main divisions of Professor Johnson's book on contracts and specifications are: Part I., Synopsis of the Law of Contracts; Part II., General Clauses in Engineering Specifications and Accompanying Documents; Part III., Specific Descriptive or Technical Clauses in Specifications; Part IV., Illustrative Examples of Complete Contracts and Specifications.

It is recognized that "the man who is his own lawyer has a fool for a client" and the author has not undertaken to teach engineers the law of contracts or to fit them to fight their own cases; but he has hoped to enable them to keep out of some trouble and to lead them to recognize when they ought to go to a lawyer. In fact, he recommends that the reader refer all important principal cases to his attorney, or else consult the standard works themselves. With this we quite agree, except that we should omit the clause beginning "or else." A very important part of an engineer's education is the study of the law, at least the fundamentals of the common law and the law of contracts; but the object of such study is not to enable the engineer to act as his own attorney; but, first, to give him a broad and solid conception of his rights and duties and relations to other men; and, second, to relieve him of any notion that he is a lawyer. Professor Johnson in his synopsis of the law of contracts aims to present such rules and principles as may profitably be put before undergraduate students in the higher engineering schools and as will give to the practicing engineer or architect certain guiding principles; but he says "this work is intended to emphasize the necessity of consulting competent legal authority in all important matters." The synopsis covers only 65 pages, of agreeably large print, and will undoubtedly be read often and with great profit by engineers old and young.

In treating of the general clauses in specifications, etc., the author takes up the matters of advertisements, guarantees and right of rejection, instructions to bidders, forms of proposals, and finally, and most important, the general specifications. Under this topic a careful analysis is made of the purposes of specifications and of the practice in making them. In this treatment the conditions are taken up one by one, explained and defined and illustrated by actual examples from practicing engineers. For instance, opening the book at random, we find the heading "Settlement of Disputes." Here the duties and powers ordinarily devolved upon the engineer are described, and a clause is quoted from the contracts of Emil Kuichling, providing that the chief engineer shall be the referee in disputes and that his decisions shall be final.

Part III., Specific Descriptive or Technical Clauses, and Part IV., Illustrative Examples of Complete Contracts and Specifications, are the divisions of the volume to which most space is given. In Part III., as may be understood from the title, specifications for various works and materials are taken up; for instance, earthwork, ex-

cavation and grading, under which topic we are told what the specifications should define and cover, illustrated by the specifications of the Pennsylvania. Specifications for sewer pipe are described, and illustrated from the practice of Mr. Kuichling. Specifications for asphalt pavement are illustrated by extracts from those of Mr. A. P. Boller for the new bridge over the Harlem River. Specifications for wrought iron and steel railroad bridge superstructure are illustrated by the specifications drawn by Mr. George S. Morison.

The example of complete contracts and specifications, which fill 147 pages of the volume, will be found of great convenience and use. Here are brought together specifications prepared by men of the highest authority, in actual work, on a considerable variety of subjects, covering, pumping engines, boilers and settings, an engine house, highway bridges, the masonry lock of St. Mary's Falls Canal, a water-works dam and a great steel building. The author says that they are not given to be blindly copied, but rather as illustrating a good method of treating the subject and to serve as patterns, and he certainly has done the profession a service in bringing these examples together in such form that they may be conveniently consulted.

The system of the book is excellent both for the student and for the man who wants to refer to it in the course of his work. The student is led logically on by precept and example; and the casual user can find what he wants with a minimum of trouble.

Examination of Water for Sanitary and Technic Purposes. By Henry Leffmann, A. M., M. D., Ph. D., Professor of Chemistry, etc. Third edition, revised and enlarged; 12 mo.; 150 pages, with index. Philadelphia: P. Blakiston Son & Co., 1895. Price $1.25.

Dr. Leffmann's little book is primarily and mostly a handbook of methods and operations to be used in analysis of water, and as such it is compact and comprehensive. The space devoted to boiler waters is very little, about four pages being given to a description of the conditions which cause corrosion and scale, and a couple of pages to the methods of purification. The chapter on the complicated and important subject of the purification of drinking water is too short to treat the subject with any thoroughness, but it is useful, so far as it goes in telling what the processes are. The real importance of the book is, however, as a handbook of methods of analysis.

TRADE CATALOGUES.

Marine Engines, Boilers, Steam Yachts, etc. Charles P. Willard & Co., 197 South Canal street, Chicago, 1895.

We have received an interesting catalogue from the above company, illustrated with good half tone cuts, and describing the various types of marine boilers, engines, steam launches, yachts, etc., which they build. One of their specialties is the Willard high speed marine engine built in three sizes from 25 to 50 H. P. The small compound fore and aft marine engines built upon designs by Mr. Willard, are also well worthy of notice. The list of steam yachts, launches, etc., which the company has for sale or charter, is very extended, and includes anything from a 25 ft. steam launch to a twin screw steel ocean steamer. The company also makes propellers, steering wheels and various other yacht fittings and appliances.

Society for the Promotion of Engineering Education.

We began last week the publication of a report of the papers and discussions at the Springfield meeting of the Society for the Promotion of Engineering Education. Our report is continued this week by an abstract of the address of the retiring President, Prof. George F. Swain, of the Massachusetts Institute of Technology. Further reports of papers and discussions will be given next week.

PRESIDENT'S ADDRESS.

After calling attention to the rapidity with which the society had grown, from a beginning with 70 members two years ago, to a present membership of 191 at the close of this session, a growth which indicates that the society has a mission, he proceeds to call attention to some of the objects of the society. The most important is to enhance the reputation and influence, even to formulate more definitely the existence of the *profession of engineering teaching.*

Teaching is in itself a profession; too often, especially in applied sciences, it is assumed that the successful practitioner will be the successful teacher. Teachers in technical colleges have made the mistake of considering their work a branch of engineering and themselves engineers incidentally engaged in teaching. Aside from details, the principles of teaching applied to engineering must be the same as of teaching other subjects. Many of the Society have been and are members of some engineering society; few probably have been members of any educational association, or have realized the importance of co-operation with other teachers, such as those of the preparatory schools. The tendency in this condition of affairs is to detract from the importance of the profession of teaching. That the profession is so poorly paid is due in part to ourselves, who have apparently been ashamed to come out in our true colors. It matters not if things are just as bad in some other schools; if doctors and lawyers do not study the science of education it is only so much the worse for their students.

It should be recognized by all, that in engineering education, the important, the controlling, factor is *Education*, not *Engineering*, and our members should be first of all teachers, then engineers to as great an extent as circumstances will permit. A neglect to realize this, may make us, in spite of our vastly greater facilities, inferior to many of our predecessors, who, though in no sense engineers, were most excellent teachers, and to whom we owe a world of gratitude. A tendency exists in many of our technical colleges, to make the school partake of the character of an engineering establishment. There is a temptation to treat students as if their minds were trained to think accurately and correctly, whereas the important work really is to teach correct habits and methods of thought; to drill upon principles rather than details of practice, to make thinkers rather than directly engineers. The tendency mentioned appears when a laboratory is used mainly for commercial tests by students, or when it is used for any purpose other than illustrating principles, and teaching students how to use apparatus and conduct tests; much repetition little value. The tendency also appears where a large part of the instruction is given by outside lecturers not trained in teaching, although a limited amount of this serves to arouse enthusiasm and imparts interest in the subject. It appears when graduating theses are chosen for purposes other than the greatest benefit to the student. It appears also when teachers are selected, not with reference to their ability in teaching, but solely on the basis of skill or experience in engineering practice.

Unquestionably every teacher of engineering should have had some experience in engineering practice, sufficient at least to develop fully what may be called the practical and economic sense. He must of course know what he is to teach, although knowledge to an extent far beyond the limits of the instruction given is not necessary to good teaching. In applied science, unlike many branches, a thorough knowledge cannot be gained from books alone; a practical familiarity with materials, instruments and methods is required. It will not do to say that a good practitioner will not make a good teacher, yet the habits of mind involved in the two kinds of work are very different, and long experience in practice is likely to be detrimental rather than conducive to success in education. A long apprenticeship in practice should therefore be avoided by a prospective teacher; the aim should be rather to continue practice with teaching, and in this way keep in touch with the practice of the day and thus avoid ruts. Under present conditions as to teaching, it no doubt is sometimes necessary for a man fresh from practice to be put in charge of a department of instruction, but I look for the time when the quality of an engineering teacher will be such, and the value of engineering education shall be so recognized, that a young man who in the right way and with suitable preparation, devotes himself to the teaching of engineering as a profession, will feel himself securely in the line of promotion, and without fear of being superseded by a man fresh from shop or field. If engineering teaching is a profession, as I believe it is, there is no more inherent reason why a man should jump in at the top, than in the law, in medicine, or any kind of business. In any case, it will involve a loss of time in adjusting himself to his new profession, with an uncertainty whether after all he will meet with success. Success, too, must be measured, not by the number of students attracted, but by the real benefit received by the student from his instruction. In other professional schools, of law and medicine, in late years there has been some change of feeling, and recognition of the fact that the best instruction may be given by men never in active practice, but whose time has always been devoted to study and research.

The tendency to favor engineering practitioners for teachers is due in part to mistaken notions in minds of parents and scholars, that a school produces ready-made engineers. Again, many practical engineers have exerted an unfortunate influence, not appreciating the importance of the educational element, and finding out for themselves many valuable things by experience, are disposed to value such matters higher than perhaps the principles of the calculus, which has perhaps never been used in their practice. They fail to realize the importance of this subject, both for mental discipline, and a means of arriving at results of practical importance. It is human nature to recognize deficiencies and to underestimate elements contributing to success. In the writer's experience men who have attained success in engineering without technical education as a rule are more sound in their appreciation of matters of technical education than are technical graduates. By teaching only can the relative value of different elements in education be determined. Practicing engineers frequently make suggestions which every experienced engineering teacher knows to be impracticable. They fail to recognize that experience in teaching is as necessary to teaching as experience in engineering is to practical engineering.

Contrast the engineering colleges of to-day with laboratories, and greater facilities in every way, with the technical colleges of 25 years ago, with poor laboratories, if any, and with teachers of little reputation or standing as engineers, and it is a question whether the success and usefulness of our graduates is proportionately greater to-day than in the past; whether we are using our facilities as means, or as in themselves, ends; whether we are not carrying the educational superstructure higher on the *same*, or on a *narrower* foundation than heretofore. Most of our middle-aged engineers had no training in laboratories and no instruction at all to be compared in extent to what is now offered students. They did have a training in principles to whose equipment their success has been due, and without which no smattering of details will prove effective. In the present rapid advances in science it is more than ever important to first of all broaden the foundation for the loftier structure necessary.

The principal object of the Society, then, is to increase among teachers an interest in pure education, and to compel a recognition abroad of the profession to which we belong. Let the members bear in mind that they are to discuss education, not engineering.

By each gaining something from others it is possible to raise the whole standard of engineering education, and to effect still greater economies of time. It is possible to effect something as to standards, although this seems not our proper function to any large extent. We may perhaps exert a favorable influence upon preparatory schools as to entrance requirements, and secure greater uniformity. Our Committee on Entrance Requirements has done a large amount of work and will present a report of progress, which deserves careful attention. Let all our members then enter upon the work of the society with zeal and energy, feeling that it represents our chosen profession, for the advancement of which in every way our best efforts should be given.

The Norton "Sure Drop" Track Jack.

We show in the engravings a new form of track jack, made by Mr. A. O. Norton, of Boston, Mass. The body is of malleable iron, in two pieces, riveted above the foot. The latter is of one piece, making a solid base. The forged steel lifting bar has teeth on two sides, one set for holding the pawl, the other cut square for lifting.

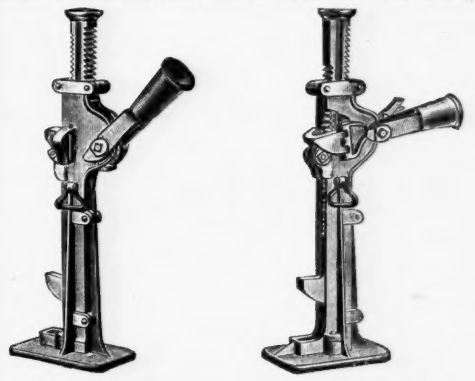


Fig.1.—Raising. Fig .2.—Lowering.

The mechanism for lifting consists of a cam on the end of a lever socket, 3, Fig. 3, working in a strap carrying the lifting pawl, 6. The cam turns on a ¾-in. hardened tool steel pin, keyed to the frame to prevent turning. The throw of the cam will raise the bar ½ in., 1 in., or 1¼ in. with one stroke of the lever. The holding teeth are cut in line with an arc struck from the center of the pin in the holding pawl, 4. As seen from Fig. 1, to raise we must turn the tripping cam, 5, which is hinged to the holding pawl, to the left.

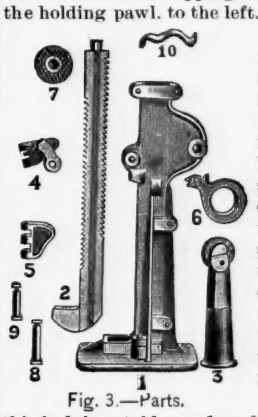


Fig. 3.—Parts.

To trip the jack, the tripping cam must be turned, as shown in Fig. 2. Then raise the lever and turn the lifting pawl back. By pressing down on the lever, we bring the end of the lever socket in contact with the cam, 5, forming a wedge, which, together with the shape of the lifting bar teeth, enables a man to easily and instantly trip with one hand any load which can be raised with the jack, with two or three men on the lever.

The tripping device in this jack is notably good, and the load can be dropped without lifting.

Sugar Railroads in Australasia.*

The Colonial Sugar Refining Company of Sydney has been in existence for more than fifty years, and now has refineries in Syndey, Melbourne, Adelaide, Auckland and Brisbane, which are supplied with raw sugar from nine mills owned by the company in New South Wales, Queensland and Fiji, supplemented by purchases from various producers. The quantity of cane transported from the fields to the nine mills mentioned is between 600,000 and 700,000 tons during a crushing season which lasts between six and seven months. At the mills in New South Wales water carriage is available; in Fiji railways are principally used for the transport, and in Queensland exclusively so. The average quantity carried by rail in one season exceeds 400,000 tons. The plant employed for the purpose is constantly being increased, and at the present time comprises, approximately, 120 miles of permanent line, 90 miles of portable line, 25 locomotives, 4,000 cane wagons and 200 wagons for sugar and general purposes.

The lines are arranged so as to have a gradient of 1 in 200, if possible, toward the mill; i. e, with the load.

The gage is 2 ft. The permanent lines have flat footed rails, usually weighing 24 lbs. per yard, either fastened

* By Mr. C. E. Forster. Abstracted from Selected Papers of the Inst. C. E.

to hardwood sleepers by dog-spikes or else bolted to steel sleepers. In the coast districts a wooden sleeper costs 7d. delivered, against 2s. 6d. for a steel sleeper; but the life of the former is short, frequently not exceeding four years. What the life of the steel sleeper may be is not yet known, but the author recently examined some that had been down for 5½ years and found very little corrosion. It seems likely that they will have three or four times the life of timber sleepers, and they possess the advantage of not necessitating disturbance of the road so often for repairs and renewals. Owing to the great difference of cost, however, they have not been extensively used.

Portable Lines.—On these lines the motive power is furnished by horses. The rails, weighing 14 lbs. to a yard, are in sections of 16 ft. 6 in. long, with six steel sleepers to each section. Each section when made up weighs about 212 lbs., and can be easily handled by two men. These portable lines form the means of communication between the canefields and the permanent lines. The junction is usually effected by a turnout of the ordinary type, but where a temporary connection only is required, an inclined plane or riding-points is used. This serves very well, notwithstanding that it has to be lifted from the rails whenever a train passes on the main line. A turnout of this kind can be equally well applied either to to the portable or to the permanent line. A portable line, when laid across a canefield, is used to clear off all the cane within a distance of half a chain to one chain. It is then removed to a parallel position at a distance of one or two chains, and so on until the whole crop has been harvested.

Rolling-stock.—The locomotives are of several types, but most of them are carried on two pairs of coupled wheels, and weigh in working order between 9 and 10 tons. The following particulars of two such engines may be of interest. The first column refers to an engine made by the Decauville Co., and the second column to an engine made by Messrs. John Fowler & Co. Both have outside cylinders and plate frames.

Diameter of cylinder	8⅝ inches	7 inches
Stroke	12⅝ "	12 "
Area of grate	5.42 sq. ft.	4.5 sq. ft.
Heating surface	129 " "	146 " "
Diameter of driving-wheels	21½ inches	23½ inches
Wheel-base	4 feet	5 feet
Weight in working order	9 tons	10 tons

Either engine will haul a gross load of 90 tons up a gradient of 1 in 200 under favorable conditions, but the ordinary working load would be 60 to 70 tons. Both are tank-engines with a capacity of 300 to 400 gallons of water. The average speed is about eight miles per hour, and 10 miles per hour is rarely exceeded.

The cane wagons are of wrought-iron, with cast-iron wheels 1 ft. in diameter and 3 ft. 3 in. apart. There are no sides, the canes being laid transversely and often overhanging 2 ft. on each side. The floor of the wagon is 5 ft. long and 4 ft. wide, and the ends are protected by a framing of light iron bars. Each wagon carries about one ton. The wagons are unloaded at the mill by hand, and the cane is conveyed by an endless band to the crushers.

In applying railroads of this kind to agricultural purposes, it must be remembered that there are few, if any, crops that yield so large a weight as does sugar cane—frequently amounting to 40 tons and sometimes to 70 tons to an acre.

Steel Tubular Under Frames for Railroad Cars.

Some recent modifications in the design and construction of tubular frames for cars are shown in the engravings herewith. We have no information concerning these designs other than the following letter from Messrs. Church & Ettenger, Dashwood House, London, which accompanied the drawings:

"We send copies of our lithograph drawings 630 and 655, the former being a design for a 34-foot underframe constructed on the cantilever principle, and the latter an ordinary frame.

"These frames are now arranged as interchangeable for all classes of freight cars—i.e., the same frame is used for box, stock, gondola, etc., and the frame can in a short time be detached from the body and floor, rendering all parts readily accessible for repairs, if required. We can supply details of the draw-gear on a larger scale; also detail of any of the types of bodies named, and of our steel bogie as re designed for United States railways."

TECHNICAL.

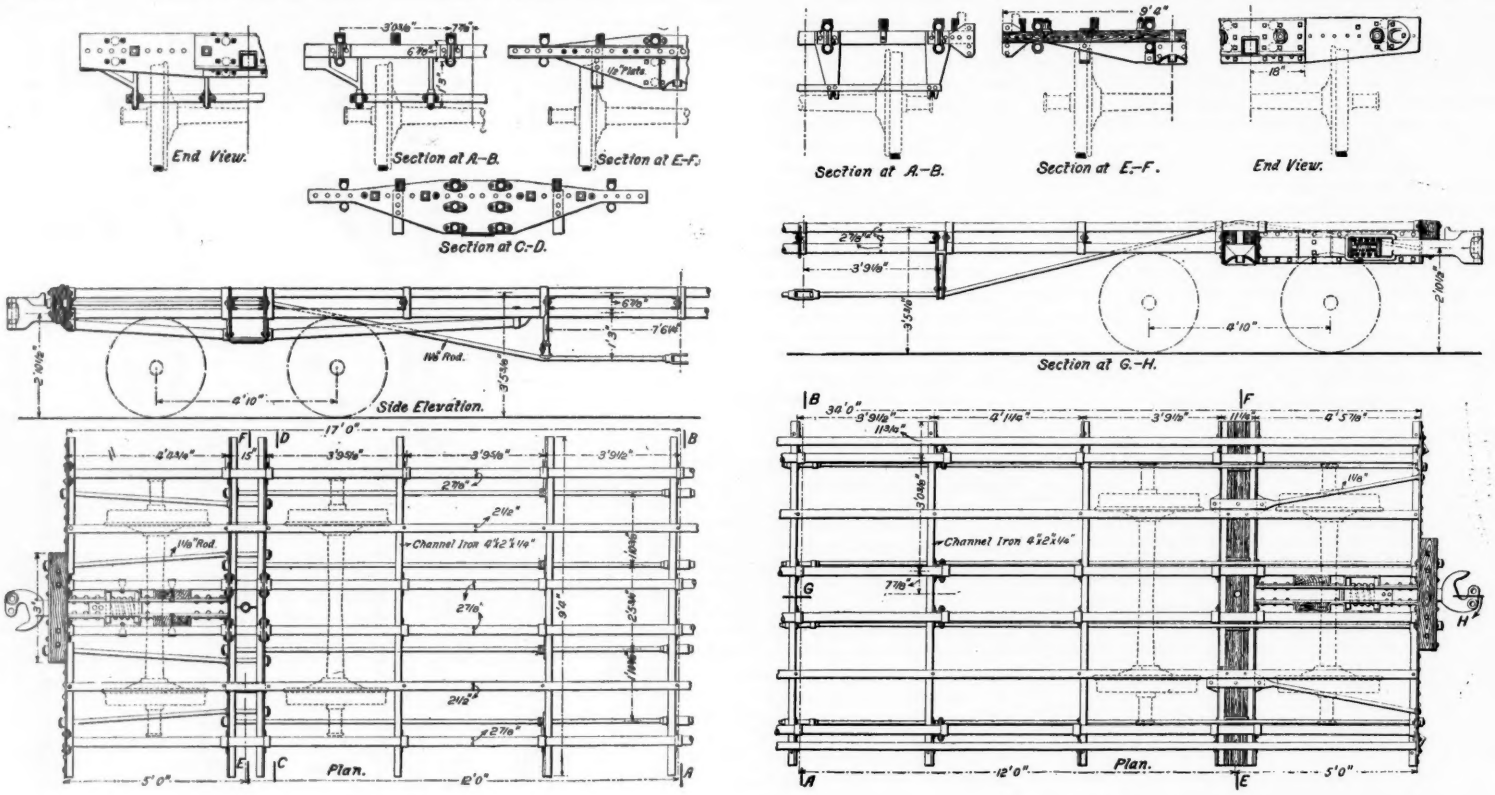
Manufacturing and Business.

The Facer Car Wheel Co., of Perth, Ont., is about starting the erection of works for the manufacture of solid steel car wheels. Stock to the amount of $76,000 has been taken up.

The Buckeye Little Giant coupler has been specified for 88 box cars now building by the Ohio Falls Car Manufacturing Co., for the Baltimore & Ohio Southwestern.

The Pratt & Whitney Company of Hartford, Conn., is building a new forge shop and an extention to the machine shop. In this extention will also be located new offices. The company states that the outlook for fall business is very encouraging.

The Buckeye Malleable Iron and Coupler Co. has just received an order from the Duluth & Iron Range road for "Little Giant" Couplers for its entire passenger equipment.



Cantilever Underframe. *Standard Underframe.*

Tabular Underframes for 60,000-lb. Cars—Church & Ettenger's Patents.

The Southern Railway shops located at Knoxville, Tenn., and Atlanta, Ga., are being equipped by the Buffalo Forge Company, of Buffalo, N. Y., with its exhaust fan outfits.

The Foster Engineering Co., of Newark, N. J., recently equipped 15 locomotives of the Lehigh Valley road with inside safety boiler checks and has just received an additional order from the same road for 30 more of the checks. The company also has orders for equipping three United States gunboats, building at Newport News, with Foster pressure regulators and reducing valves.

New Stations and Shops.

The Duluth & Iron Range has let to Barnett & Record, of Minneapolis, a contractf or building a 23-stall addition to its roundhouse at Two Harbors, Minn., making it a 56-stall house.

Oil Burning.

The Southern California Railway has now 18 locomotives in regular service burning oil, and the results are quite satisfactory. In July about 1,000 tons of oil were used and about 1,200 in August.

The Carpenter Coal Calorimeter.

We illustrated in the *Railroad Gazette* for August 30 a new coal calorimeter, designed by Prof. R. C. Carpenter, of Cornell University. Messrs. Schäfer & Budenburg, of 66 John street, New York City, are now making this calorimeter, it being particularly useful in obtaining the calorific power of fuels directly in British thermal units by a simple and easy operation.

More World's Records.

We did not suppose that the New York Central people would quietly allow the world's record for speed to be taken away from them, and apparently the recent magnificent performances of the English railroads in the "race to Aberdeen" have inspired the New York Central to an effort to make a new record. Unfortunately, the run to Buffalo is only 436.32 miles (that is, the run to that part of Buffalo where speed must be relaxed, and where the record ceases); therefore the New York Central cannot make quite as long a run at sustained high speed as has been done in the Aberdeen race. The best record from London to Aberdeen by the West Coast route was 540 miles in 512 min., equal to 63.28 miles an hour. In this run 299¼ miles were made without a stop and one run of 32 miles was made at an average of 74 miles an hour. On Wednesday morning of this week a special train was sent out from the Grand Central station for the purpose of making a record to Buffalo. We go to press too early to give final and complete figures. The run to Albany was made in 134 minutes for 143 miles, or at the rate of 64 miles an hour. The total distance of 434 miles was covered in 407 minutes, with stops. The inclusive speed therefore was 64.2 miles an hour. The two stops were one of 2 min. 10 sec. and one of 2 min. 40 sec. to change engines. Three different engines were used.

Motive Power on the Brooklyn Bridge.

At a meeting of the Brooklyn Bridge Trustees on Monday of this week the Chief Engineer was instructed to report as soon as possible upon the desirability of the use of electricity as a motive power for the bridge railroad. He was also directed to get plans and specifications from those corporations which are prepared to furnish electric apparatus for such work. Speaking offhand, without an actual study of the figures, one would suppose that this is just the place for the use of electric motive power; but a costly and highly efficient cable plant is now in service and it will take considerable figuring to show a sufficient saving to offset the interest account arising from a change of motive power.

The Grabiron Ballot—M. C. B.

Last week, p. 589, we published diagrams showing proposed modified recommended practice in the matter of grabirons, with the result of the informal ballot. The Secretary of the M. C. B. Association issues the following circular on the matter;

"The informal ballot . . . resulted as follows:

Votes cast 'Yes'		653
Votes cast 'No'	Unqualified	180
	Qualified	140
		320
Total votes cast		973

"Of the qualified votes cast against the proposition, 85 votes objected to the location of handholds underneath the end sills, and 51 votes objected to the handolds in the higher locations on the ends of box and stock cars.

"As there are 1,477 possible votes in the Association, it is impcssible to say from this test ballot what modifications can be adopted in 1896 in the recommended practice for handholds, notwithstanding the fact that more than two-thirds of the votes cast at this time are in favor of the proposed modifications."

The Iron and Steel Market.

The activity in construction work of various sorts, which has set in after the depression of the past two years, has caused a demand for steel and iron in plates and shapes seldom found even in the busiest times. Pittsburgh manufacturers report that while the rush for supplies by consumers continues unabated, some of the mills will accept no orders at any terms for the next three months. The Carnegie mills have been running up to the limit for two months, and two weeks ago it was decided that orders to be delivered in less time than 60 days would not be contracted for. The limit has since been raised to three months. Newspaper reports say that this company has on hand at present contracts ag-

gregating almost 1,000,000 tons of structural material. This should carry them well into next year. Other reports from Pittsburgh say that nothing like the present demand for boiler, firebox and other forms of plate has ever before been known. The advance in prices of pig iron is expected to affect the price of rails in the near future. Billets are now selling at rail prices, a sale of 500 tons being made in Pittsburgh recently at $24.25. Inquiries are in the market for between 30,000 and 35,000 tons. Advances of $2 per ton in structural material make the minimum quotation for channels and beams range from 1.70 cents to 1.80 cents. There is a feeling that the high prices for Bessemer pig are not healthy. Recent sales aggregate 22,000 tons at prices from $16.25 to $16.75.

Lighting Cars by Electricity.

The express trains running from Paris to Lisle have put in use a system of electric lighting of cars as follows: Lamps of 10, 8 and 6 c. p. are used in the first, second and third class compartments respectively. Accumulators are carried in each car arranged to be easily withdrawn for charging. The cars are fitted for lighting with oil in case of breakdown. Sixteen accumulators are used in each carriage, weighing 860 lbs. and supplying light for 35 hours without recharging. The total cost for a first-class carriage is $145, including accumulators. The estimated expense per lamp hour of 10 c. p. is 0.48 of a cent. This does not include labor in handling the accumulators.

Sectional Covering for Boilers.

We have recently had brought to our notice a useful form of asbestos-magnesia block covering for large steam pipes, boilers, etc., which is made by the Philip Carey Manufacturing Co., of Lockland, O. The blocks are of various sizes and degrees of curvature, suiting any circle from 6 in. to 97 in. The blocks are 30 in. long, about 1½ in. thick, and vary in width from 3 to 6 in. They are held in place by specially designed steel bands, which makes it possible to remove one block and replace it without disturbing any of the others. After the blocks are put in place non-porous felt is pasted over them, and over this is sewed and pasted a canvas jacket, making a neat finish. The covering is applicable to upright boilers, domes, tanks, etc., making it possible to use it as a removable covering on these surfaces.

We have received, in addition to the pamphlets descriptive of this covering, several other catalogues from the above company illustrating various types of valve fittings, cement roofings, boiler lagging, etc. The magnesia flexible cement roofing for freight cars, buildings, etc., of which we have received a sample, seems to possess the elements of a good roofing compound, and, if it has the many advantages that are claimed for it, should be very desirable. It is formed of a foundation sheet of stringed wool felt upon which is placed a heavy flexible cement body. In this is imbedded burlap, the whole being covered with a fireproof surface coating. This roofing, it is claimed, is not affected by change of temperature, does not run in the hottest weather nor become brittle and crack during cold weather.

THE SCRAP HEAP.

Notes.

The roundhouse of the Long Beach Railroad at Barnegat Station, N. J., was destroyed by fire Sept. 3, together with its contents, including a locomotive and two cars.

Lake Notes.

The F. W. Wheeler Co., of Bay City, is building for the lumber traffic a steamer that will carry over 1,600,000 ft. of pine at a cargo. This will be the largest modern vessel ever in the lake lumber trade.

The Duluth syndicate, which recently launched the 400 ft. Zenith City at Chicago, has let a contract at Cleveland for a steel steamship 420 ft. long, and to have a freight capacity for about 7,500 gross tons on 20 ft. draft. Because of the advance in the price of materials, this vessel, which could have been built in the winter for $230,000, will now cost $260,000.

The traffic of the Sault Ste. Marie Canal for August amounted to 2,481,736 tons, leading the preceding greatest month by about 4,000 tons. The traffic of this season to date has been 8,858,148 tons, against 7,386,824 tons for the same period last year. It is interesting to note in this connection that never, prior to 1890, when the business of the canal was 9,000,000 tons, had the total for the full year been within a million tons of this year to Sept. 1. The growth of the passenger traffic of the canal is shown in the fact that there have been carried to date 24,368 people, which is about the total for any year up to the last. Of the chief items of freight through for the month the following are worthy of note: Iron ore, 1,473,612 tons; coal, 453,591; flour, 113,578; lumber, 138,152,000 ft.; wheat, 2,695,137 bu.

The August business of the ports of Duluth and Superior include 675,000 tons of iron ore, 2,250,000 bu. of wheat, 27,000,000 ft. of lumber, 253,000 tons of coal, besides much other freight.

Business of the Suez Canal.

The United States Consul at Barmen, Germany, has made a report on the business of the Suez Canal for 1894, which gives the gross receipts of the canal company as $15,390,230, against $14,764,906 for 1893. If the revenues from the tramway from Port Said to Ismalia, the lands, and water company, are eliminated, the actual receipts of the canal were $650,800 greater than in the previous year. English trade with the far East improved to the extent of more than $15,000,000 last year. Although the number of ships that passed through the canal in 1894 was less than in several previous years, the tonnage has only been exceeded in 1891, when it reached the record figure of 8,698,777 tons. The net tonnage last year amounted to 8,039,175 tons.

The End of the Race to Aberdeen.

As announced in last week's *Transport*, the East Coast companies yesterday week beat their rivals and all previous records by running their train from London to Aberdeen in 8 hours and 40 minutes. The West Coast Companies made a supreme effort on the following night and again demonstrated their superiority in running power by covering the distance in 8 hours and 32 minutes, or at the rate of something more than 63 miles an hour. Now as to the compromise. It has been decided that the East Coast Express, leaving King's Cross at 8 p. m., will in future reach the granite city at 6:25 on the following morning. This does not revert to the old time, but to the accelerated speed which had been the order of the day since July 2—about equal to that of the Empire State Express from New York to Buffalo. The West Coast Companies, after demonstrating to the world that, although their route was the longest and most difficult, they could, under given conditions, running the fastest trains, determined to content themselves with arriving in Aberdeen in future at 7 o'clock in the morning—35 minutes behind their rivals. The Aberdeen public are not entirely satisfied with the compromise, but it is hardly reasonable for them to expect that the railway companies will continue forever to race for their benefit. The performances on both routes have been splendid. It is true that the East Coast Companies have beaten their rivals twice only during the struggle, but they have had a most chivalrous regard for the rules of the game. The expresses with which their best achievements have been accomplished were of the ordinary weight, and they closely observed the times of departure from, as well as arrival at, the intermediate stations.—*Transport* (London), Aug. 30.

Old-School Conductors Down South.

At the North and in the West the conductor is as uncommunicative an official as a policeman. He never smiles or relaxes for a moment when on duty. He knows no one in the discharge of his duty, which he goes through with military exactness. On rare occasions he will nod to a commuter, but the nod is not to be taken as any evidence of relaxation of official routine. He is addressed as "Conductor," and seems to have no name beside that. The moment you cross the Potomac everything is different. The conductor is called "Captain," he knows everybody, has something pleasant to say and is ever ready to succor a distressed maiden or an old lady in difficulty. He will stop the train between stations, if he catches sight of an old old lady driving down the road, and will help her out of the carriage, bundles and all, and say: "This way, grandma, to the ladies' car," find her a comfortable seat, and inquire about the health of her entire family. Then he jerks the bell for the train to move on. He knows every inmate of every farm or plantation on his run. Often he is an old soldier, and runs up against an old comrade, and then dire threats are made about putting him off the train if he don't "hand out that ticket right away." Always friendly, pleasant and provincial, but never vulgar, he is a terror to the occasional tough or drummer who gets noisy or loud, and is not afraid of anything that wears clothes. If there is an accident he has nerve, sense and forethought, and comes out uncommonly strong as an emergency man.—*Washington Post.*

London & North Western.

The following is an abstract of the report of the London & North Western for the six months ending June 30, 1895, on 1,897 miles worked:

Earnings:	
Passengers	£1,716,289
Parcels, horses, carriages and dogs	386,756
Mails	94,411
Freight	1,954,528
Live stock	86,591
Minerals	1,135,699
Rents	98,901
Dividends on shares	81,916
Balance brought forward from previous report	53,459
	£5,608,540
Disbursements:	
Working expenses	£3,061,955
Interest on debenture stock and loans	530,719
Chief rents, leases, etc	130,360
Dividends, 4 per cent. per annum on guaranteed and preference stocks	763,620
Dividend, 5¼ per cent. per annum on ordinary stock	1,065,791
Balance carried forward	56,095
	£5,608,540
Passengers carried	32,800,030
Tons of freight carried	17,849,960
Mileage of passenger trains	10,278,073
" freight "	9,510,925

The percentage of working expenses to traffic earnings was 56.97.

A Bridge Accident.

On July 2 a train on the Missouri, Kansas & Texas Railway wrecked a bridge over the Femme Osage River. We have the following official statement of the circumstances:

"The accident referred to occurred about 5:30 a. m., July 2, at the bridge A-43 over the Femme Osage River, between Hamburg and Matson, Mo., or about 15 miles south of St. Charles, on our St. Louis Division.

"The accident was caused by the bridge giving way under an engine being transported for the Southern Pacific Company. The train consisted of 18 empty stock cars, caboose and four engines, which were equally distributed throughout the train, and weighed, including tender, from 168,000 to 195,650 lbs. each.

"The bridge referred to was about eight years old, and was originally constructed by the Missouri Central Railway Company. It was the combination type, with wooden upper chords and wooden floor system, the upper chords and floor beams having been reinforced after coming in possession of this company.

"The immediate cause of the accident was the giving way of the last floor-beam after the entire train had passed over the bridge, except the last engine. The damage to the engine was very slight and there was no injury to persons."

The Sea Beach Collision.

The coroner's jury, impanelled in the inquest on the death of the passenger who died from the injuries received in the collision on the New York & Sea Beach road, on Sept. 2, returned a verdict to the effect that the railroad company was criminally negligent for failing to provide a proper signal system and telephone and telegraph communication along the route as safeguards against such accidents as the one in question. The jury exonerated the employees of the company from all blame. The Superintendent testified that, in his opinion, the first collision of the helping engine with the train of empty cars in the yards, disabled it so that it would have been impossible for the engineer to stop it before the collision with the excursion train occurred He thought that the engine must have traveled the three miles between the Bay Ridge station and the scene of the wreck in four minutes. The engineer of the helping engine testified that he had been employed as an assistant engineer on the road for 10 months and was previously a fireman. He had passed no examination when promoted. He had only five or six hours' sleep in the 24 hours preceding the day of the accident. Jensen, the engineer, is only 24 years old. His fireman had only been employed a few days. Both testified that they were thrown from the engine by the collision with the empty train in the yard.

The Elliott Cresson Medal.

The Committee on Science and Art of the Franklin Institute has recommended the award to Mr. Henry M. Howe, of Boston, of the Elliott Cresson medal for his experimental researches and discoveries in the heat treatment of steel. Mr. Howe is the author of the great work on the Metallurgy of Steel, published a few years ago by the Scientific Publishing Co.

New Trans-Atlantic Freight Steamship.

The Hamburg-American Steamship Line has contracted with the shipbuilding firm of Harland & Wolff, of Belfast, Ireland, for a new steamship to engage in the weekly fast freight service between New York and Hamburg. She will be one of the largest steamers of her type, her displacement of 20,000 tons exceeding that of the Campania by 15 per cent. The principal dimensions of the vessel are to be: Length, 560 ft., which is 2 ft. longer than the new White Star freight steamship Georgic; beam, 62 ft.; depth of hold, 42 ft. She will have accommodations for 200 cabin and 1,500 steerage passengers. Stalls will be fitted up for a large number of cattle and horses. She will be fitted up throughout with electric lights and equipped with spacious refrigerators for transportation of perishable cargo. Her speed will be about 13½ knots an hour. She will have two sets of triple-expansion engines and about 5,500 I. H. P.

LOCOMOTIVE BUILDING.

The Grand Trunk has just completed a compound freight engine at its shops in Montreal.

CAR BUILDING.

The Canadian Pacific carshops at Perth, Ont., have received orders for the construction of 100 box cars.

The Erie Car Works, Erie, Pa, Hamilton & Knoll, Proprietors, have just received an order for 50 gondola coal cars of 50,000 lbs. capacity from Messrs. H. K. Wick & Co., Incorporated, of Buffalo, N. Y.

The Barney & Smith Manufacturing Co., of Dayton, O., has secured an order for 200 gondola cars to be built for the Washington Coal & Coke Co., of West Virginia. These cars are to be equipped with the Trojan car coupler.

BRIDGE BUILDING.

Detroit, Mich.—The contracts for a 50-ft. span arch bridge, Melan system, below the Michigan Central tracks on the Southern Boulevard, was let by the Park Commissioners to T. J. Kennedy, of Detroit, for $34,122, exclusive of excavation.

Goldsboro, N.C.—The authorities of the Atlantic & North Carolina Railroad will strengthen and otherwise improve some, and replace other old bridges on its line between this place and Morehead City, N. C. (102 miles), by new structures. The officers of the company are at Newbern, N. C., where the President, A. & N. C. Railroad, can be addressed for particulars.

Halifax, N. S.—The Provincial Commissioner of Public Works and Mines has invited tenders for the construction of an iron bridge over the river at Middle Stewaicke to replace the wooden one, the work of construction to be completed by November.

Hamilton, Ont.—The Dominion Bridge Co., of Montreal, has the contract for the bridges on the Welland line of the Toronto, Hamilton & Buffalo road. There are two steel bridges and two viaducts to be built.

Kensington, Que.—The government engineers have been taking soundings in connection with the construction of a steel bridge across the Gatineau River at this point. The estimated cost is $20,000.

London, Ont.—A subscription list is being circulated among the citizens for the construction of a bridge at the foot of Richmond street.

Ottawa, Ont.—The construction of the Cedar Street Electric Railway Bridge is being pushed rapidly forward. The piers are of concrete and between them is sufficient room for five tracks.

The proposed new bridge over the canal from Maria to Theodore streets is estimated to cost $100,000 and will be about 250 ft. in length. The city will be required to build the approaches and the railroad companies the bridge proper, but it is probable the Government will be asked to contribute a share of the cost.

Philadelphia.—The Board of District Surveyors has approved plans of bridges over Allegheny avenue and Ontario street for the use of the Fairhill street railroad.

Ridgewood. N. J.—Bids were to be opened on Sept. 9 for the construction of a 40-ft. span bridge, Melan system.

Toronto, Ont.—The plans for the John street bridge have been signed by the Chief Engineer of the Grand Trunk and Mr. Thomas Tait, Assistant General Manager of the Canadian Pacific. An arrangement has been entered into by which the Canadian Pacific will complete the structure and an agreement with the Grand Trunk will shortly be drawn up.

RAILROAD LAW—NOTES OF DECISIONS.

Carriers of Goods and Injuries to Property.

In Texas it is held by the Supreme Court that a railroad which does not own refrigerator cars, but has an arrangement with the owners of such cars whereby it can furnish the same to its shippers, is liable for injuries to shippers caused by delay in furnishing cars when promised.[1]

In New York the carrier placed a horse, delivered to it for transportation, in a car, one door of which could not be closed, and the car was put in a train without being inspected. After the train started, the horse fell out of the car and was killed. It is held that the defendant was guilty of gross negligence, within a provision in the contract of shipment that a carrier should not be liable except for gross negligence.[2]

The Supreme Court of Georgia rules that to entitle a connecting carrier to the benefit of a special contract between the shipper and the receiving carrier limiting

liability in case of loss, it must appear either that the contract was such as to bind the receiving carrier for full performance, so as to make the connecting carrier its agent, or that the reduced rate forming the consideration of the special contract was not confined to the line of the receiving carrier, but extended and applied to the connecting line also.[3]

In Texas it is held that where a local station agent has been for six months issuing bills of lading to points beyond his company's line, a contract made by him for transportation over a connecting line is binding on the agent's company, though it has instructed him not to make such contracts, in the absence of actual or constructive knowledge of such instructions by the shipper.[4]

The Supreme Court of North Carolina rules that in an action against a railroad to recover for goods burned in its warehouse, evidence that a night telegraph operator, who worked in the warehouse, and slept therein, was an habitual drunkard and was drunk at the time of the fire, does not justify a verdict for plaintiff.[5]

Injuries to Passengers, Employees and Strangers.

In Texas the plaintiff boarded the wrong train, without being misled by an employee of defendant, and the mistake was not discovered till the conductor took up tickets, when plaintiff refused to pay his fare to the next station; but he obeyed the conductor in getting off when the train stopped for him. It is ruled by the Supreme Court that it was not the conductor's duty to carry plaintiff to the next station, or to a place where he could rest in comfort, so that he might return on the next train.[6]

In Massachusetts it is said that the rule that a person who, by mistake, takes a wrong train, is not obliged to pay for his ride to the first station at which he has an opportunity to alight, is not available to one having a season ticket and taking a train in the belief that it was good on such train.[7]

In Missouri the rear car of an electric railway train was just passing over the further crosswalk at a street crossing, at which the city ordinance required it to stop for passengers, and was running three miles an hour, when plaintiff came on the street. Plaintiff, intending to board the train, ran towards the motor car, but was not seen by the conductor until within 10 ft. of the car. There was no slacking of speed or other act showing any intention on the part of the conductor or motorman to accept him as a passenger. The Supreme Court holds that by his attempt to board the train he did not become a passenger so as to require of the railway company the highest degree of care to avoid injuring him.[8]

In North Carolina it is ruled that a passenger alighting from a moving train at the direction of the conductor is not, as a matter of law, guilty of contributory negligence, where there was no appearance of danger either in the locality where he alighted or the rate of speed of the train.[9]

The Supreme Court of Texas decrees that the time limited on a railroad ticket, within which a trip must be completed, must, in order to be binding, allow sufficient time for a person using ordinary diligence to accomplish the trip.[10]

In Wisconsin a minor of average intelligence, 18 years of age, while employed in loading dirt on a flat by means of a wheelbarrow which he was required to wheel over a narrow timber which bridged a deep cut, was injured by falling from the timber, on account of his barrow running off. The barrow did not run true on its axle, but plaintiff was aware of the fact. The Supreme Court rules that he assumed the risk of such injuries, and could not recover therefor.[11]

In Texas it is negligence for a railroad engineer to run a train at a high rate of speed, on a dark night, over a track which is under water.[12]

In Alabama the fact that a stop block at the end of a trestle was defective, will not render the company liable for the death of an engineer who ran his engine off the end of the trestle, where the accident was caused by running the engine at such a speed that no block would have been effective.[13]

In Iowa an employee is not bound, from the nature of his employment, to know, at his peril, that making a coupling of a pilot bar to a box car is unusually dangerous, and does not assume the risk unless, as a reasonably prudent and careful man, he should have known that it was unusually dangerous.[14]

In Texas, where a section foreman in charge of a hand car fails to send a flag around a curve, according to the rules of the road, and is injured thereby, he is guilty of contributory negligence.[15]

The Supreme Court of Iowa rules that where plaintiff, a brakeman, acting under orders from his superior, attempted to couple cars, knowing that a passenger train was soon due, and that unless the coupling was made there would be danger of collision, his knowledge of defects in a pilot bar used in coupling will not preclude a recovery for injuries caused thereby.[16]

In Texas, in an action by a brakeman for injuries caused by the placing of a car on a side track too near the main track, it appeared that the car was one of several placed on the side track by the crew to which plaintiff belonged; that, when they were so placed, he rode in on the side track on the car which was furthest from the switch, to set the brake; that the switch was thrown by another of the crew; that it was dark; and that it was the duty of all the crew, but especially of the person who threw the switch, to see that the car on the side track was not left too close to the main track. The Supreme Court holds that a finding that plaintiff was not negligent in failing to see that the car was at a proper distance from the main track was justified.[17]

In Texas the mere fact that an employee, continuing his work under a promise that a defect in the machinery shall be repaired, knows that it has not been repaired, does not impose upon him the risk of any injury arising from the defect.[18]

In New York where a railroad fails to promulgate any rules for the government of its yard, the suffering of a loaded car to stand on the track on the grade without having the brakes set is an omission of the company, and not of the fellow servants of a brakeman who is injured thereby.[19]

In Indiana a carpenter in a railway company's repair shop, in placing new handles on a hand car, acts as the company's vice principal, as regards section hands using the car in going to and from their work, so as to impute his knowledge of defects in the wood used for the handles to the company, and thereby render the company liable for injuries to the section hands, caused by such defects.[20]

In Texas it is the duty of a railroad, as to an employee lawfully riding on its train, to maintain such ditches along its track as will prevent the accumulation on the track of the water from an ordinary rain storm.[21]

In Indiana it is held that a promise by an employer that "he would take all the risks of any accident that might occur" to an employee, does not include injuries caused by contributory negligence.[22]

In Michigan it is held that where a brakeman, in violation of his contract and the company's rules, ran in front of an engine tender moving on a track which the brakeman had just passed over, in order to straighten a coupling link thereon, and in stepping sideways in front of the tender, to keep out of its way, stumbled over a pile of ashes between the rails, which he could have seen had he looked, and was injured, he was guilty of contributory negligence, though it was the custom for brakemen to perform such an act in a similar manner.[23]

In Georgia it is held that a complaint alleging that plaintiff's minor son, while working without pay in defendant's railroad yards by consent and for the purpose of learning the yards, under promise of employment, stepped from one track to another to avoid a moving train, and, while his attention was distracted by its noise, was struck without fault on his part, by a freight car negligently "kicked" along the second track, and died from his injuries, states a cause of action.[24]

The Supreme Court of Iowa holds that rules of a railway prohibiting trainmen from using any unsafe appliances, and stating that the company will furnish its employees safe appliances, do not prohibit an attempt by an employee to couple a box car to an engine with a pilot-bar coupling, where, although such a coupling requires more care than in making ordinary couplings, if it could be safely made by the use of due care.[25]

In Texas the running of a freight train at about 30 miles an hour round a curve is not negligence as matter of law, so as to render the company liable for injuries to a section man who was riding on a hand car with which the train collided.[26]

In Minnesota it is held that in a cold climate, railroad employees assume the risks incident to the accumulation of snow and ice on the tracks.[27]

In Kentucky the mere fact that the body of a track walker was found near his employer's track, in such at position as to indicate that he was struck by one of its trains, does not impute negligence to the company.[28]

The Supreme Court of Minnesota rules that where a wiper employed in a railroad roundhouse is injured while assisting in straightening a cable used to pull a plow in unloading gravel from cars in repairing the track, he is injured by exposure to hazards peculiar to the repair and operation of railroads, within the statute, making railroad companies liable for the negligence of fellow servants in such cases.[29]

In Iowa a foreman of a railway gang employed to keep the track in repair is engaged in the "operation" of a railway, so as to render the company liable to him for injuries due to the negligence of a co-employee.[30]

In California a person killed at a railroad crossing, by a train running 30 or 35 miles per hour, had just driven rapidly to the crossing from a point 400 feet therefrom, where there was a view of the track in the direction from which the train was coming for four-fifths of a mile from the crossing, with the exception of the 1,500 ft. next to the crossing, which were obscured by an orchard extending along the side of the highway to the railroad right of way, which was 100 ft. wide. Deceased did not attempt to check his horses till coming into the right of way, when, they being frightened, he was unable to stop them. The Supreme Court holds that he was negligent, as he, when 400 ft. distant, either could have seen the train, or else thereafter drove at a reckless speed.[31]

The Supreme Court of Missouri rules that where a colored boy, 11 years of age, possessed of ordinary intelligence and the knowledge that proper care required him to look and listen before venturing upon a railroad track, did not do so, and was struck by a train, he was guilty of such contributory negligence as prevented recovery of damages, although the train was running at an unlawful rate of speed.[32]

In Texas it is held that where one attempting to drive across a railroad crossing was struck by an engine, of the approach of which no warning was given, and which he could not see until he was on the track, the railroad company is not relieved from liability by the fact that, in trying to escape, he rashly jumped from the wagon, by remaining in which he would have escaped uninjured.[33]

In Wisconson plaintiff, in approaching defendant's tracks, stopped for some minutes at a point where his view of the track on the east side of the street was cut off by a building which entended to within 30 ft. of the tracks. He knew the crossing thoroughly, and was aware that defendant's construction train was constantly crossing, but he did not look at the track on the east side after passing the building, and was struck by the construction train coming from that direction. The Supreme Court rules that he was guilty of contributory negligence.[34]

In Kentucky it is gross negligence for a railroad to allow its cars to be "kicked" across a crowded street crossing, where no watchman is stationed, without sounding a whistle or bell.[35]

[1] Int. & G. N. R. Co. v. Young, 28 S. W. Rep., 819.
[2] Root v. N. Y. & N. E. R. Co., 31 N. Y. S., 357.
[3] Cen. R. Co. v. Bridger, 20 S. E. Rep., 349.
[4] G., C. & S. F. Ry. Co. v. Cole, 28 S. W. Rep., 391.
[5] Young v. W. & W. R. Co., 21 S. E. Rep., 177.
[6] M., K. & T. Ry. Co. v. Dawson, 29 S. W. Rep., 1106.
[7] N. Y. & N. E. R. Co. v. Feely, 40 N. E. Rep., 20.
[8] Schepers v. Union Depot R. Co., 29 S. W. Rep., 712.
[9] Watkins v. R. & A. R. Co., 21 S. E. Rep., 409.
[10] G., C. & S. F. Ry. Co. v. Wright, 30 S. W. Rep., 294.
[11] Casey v. C., St. P., M. & O. Ry. Co., 62 N. W. Rep., 624.
[12] H. & S. A. Ry. Co. v. Norris, 29 S. W. Rep., 950.
[13] L. & N. R. Co. v. Stutts, 17 South Rep., 29.
[14] Kerns v. C., M. & St. P. Ry. Co., 62 N. W. Rep., 692.
[15] So. Pac. Co. v. Ryan, 29 S. W. Rep., 527.
[16] Strong v. Iowa Cent. Ry. Co., 62 N. W. Rep., 799.
[17] Int. & G. N. R. Co. v. Sipole, 29 S. W. Rep., 686.
[18] T. & N. O. R. Co. v. Bingle, 29 S. W. Rep., 674.
[19] Redington v. N. Y. O. & W. Ry. Co., 32 N. Y., S. 535.
[20] Ind., I. & I. Ry. Co. v. Snyder, 39 N. E., Rep. 912.
[21] H. & S. A. Ry. Co. v. Norris, 29 S. W. Rep., 950.
[22] Phillips v. Michael, 39 N. E. Rep., 669.
[23] Loranger v. L. S. & M. S. Ry. Co., 62 N. W. Rep., 137.
[24] Hudson v. E. T., V. & G. R. Co., 21 S. E. Rep., 126.
[25] Kerns v. C., M. & St. P. Ry. Co., 62 N. W. Rep., 603.
[26] Int. & G. N. R. Co. v. Arias, 30 S. W. Rep., 446.
[27] Lawson v. Truesdale, 62 N. W. Rep., 546.
[28] Johnson v. East Ten., V. & G. Ry. Co., 30 S. W. Rep., 415.
[29] Nichols vs. C., M. & St. P. Ry. Co., 62 N. W. Rep., 386.
[30] Haden v. S. C. & P. R. Co., 60 N. W. Rep., 537.
[31] Pepper v. Southern Pac. Co., 38 Pac. Rep., 974.
[32] Payne v. C. & A. R. Co., 30 S. W. Rep., 148.
[33] Int. & G. N. R. Co., v. Neff, 28 S. W. Rep., 283.
[34] Nelson v. D., S. S. & A. Ry. Co., 60 N. W. Rep., 703.
[35] Peltier v. L. & N. R. Co., 29 S. W. Rep., 30.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, quarterly, 2 per cent., payable Sept. 30.

Camden & Atlantic, semi-annual, 2½ per cent. on the preferred stock, payable Sept. 16.

Chicago & Eastern Illinois, quarterly, 1½ per cent. on the preferred stock, payable Oct. 1.

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1¼ per cent. on the preferred stock, payable Oct. 1.

Mexican Northern, 1 per cent., payable Sept. 20.

West Jersey, semi-annual, 3½ per cent. on the preferred stock, payable Sept. 16.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Canada Atlantic, annual general, Ottawa, Sept. 24.

Chicago, Detroit & Canada, annual general, Detroit, Mich., Sept. 25.

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 21.

Louisville, New Albany & Chicago, annual, Sept. 18.

Michigan-Peninsular Car Company, 184 La Salle street, Chicago, Ill., Oct. 1.

Minneapolis & St. Louis, annual, Minneapolis, Oct. 1.

Ottawa, Arnprior & Parry Sound, annual general, Ottawa, Sept. 24.

St. Lawrence & Adirondack, special general, Montreal, Sept. 13.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *International Railroad Conference of Young Men's Christian Association* is to be held at Clifton Forge, Va., Sept. 13, 14 and 15. Mr. C. J. Hicks, 40 East Twenty-third street, New York City, is Secretary of the Railroad Department of the International Committee. The programme was published in the *Railroad Gazette* of Aug. 9.

The *American Association of General Baggage and Ticket Agents* will hold its semi-annual meeting at Boston, Sept. 17.

The *American Association of General Passenger and Ticket Agents*, will hold its semi-annual meeting at the Hotel Vendome, Boston, Sept. 17.

The *New England Roadmasters' Association* will hold its annual meeting at the Revere House, Boston, on Sept. 18 and 19. The programme was published in the *Railroad Gazette* of Aug. 9.

The *American International Association of Railroad Superintendents of Bridges and Buildings* will hold its annual meeting at New Orleans, La., Oct. 15.

The *American Street Railway Association* will hold its annual meeting at the Windsor Hotel, Montreal, Oct. 15 to 18.

The *Roadmasters' Association of America* will hold its annual meeting at St. Louis, Mo., Oct. 15, 16 and 17.

The *American Railway Association* will hold its fall meeting at New York City, Oct. 16.

The Engineers' and Architects' Association of Southern California meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The Engineers' Society of Western New York holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Tuesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago. The business meetings are held on the first Wednesday at its rooms. The meetings for the reading and discussion of papers are held on the third Wednesday at the Armour Institute, Thirty-third street and Armour avenue.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jeffer-

son street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

The *Association of Civil Engineers of Cornell University* meets on Friday of each week at 2:30 p. m., from October to May, inclusive, at its association rooms in Lincoln Hall, Ithaca, N. Y.

American International Association Railway Superintendents of Bridges and Buildings.

The fifth annual meeting of this Association will be held on Oct. 15, 1895, at New Orleans, La. The convention will meet at the Hotel Grunewald, which is located on Baronne, near Canal street. The hotel expenses will be $2.50 per day for each person.

Society for the Promotion of Engineering Education.

The officers elected at the Springfield meeting for the coming year are: President, Mansfield Merriman, Lehigh University; Vice-Presidents, F. O. Maroni, Kansas State University, and Cady Staley, Case School of Applied Science; Secretary, C. F. Allen, Massachusetts Institute of Technology; Treasurer, J. J. Flather, Purdue University.

Traveling Engineers' Association.

The third annual convention of the Traveling Engineers' Association convened in Pittsburgh, Sept. 10, about 50 delegates being present at the first session. President C. B. Conger, of Grand Rapids, delivered his annual address, speaking of the increased influence for good of the association, and the large additions in membership. Second Vice-President J. L. Brooks, of the Pennsylvania company, welcomed the delegates. Reports of committees took up the remainder of the day's session.

PERSONAL.

—Col. G. Howard Ellers, Engineer of Track Elevation for the City of Chicago, has resigned that position.

—Mr. L. S. Rose, Assistant Engineer Maintenance of Way of the Big Four at Springfield, O., has been appointed Road Master of the Central Vermont.

—Mr. Carey E. Cowgill, nearly 20 years General Solicitor of the Cincinnati, Wabash & Michigan and Division Counsel of the Big Four, has resigned those offices.

—Mr. Elliott Lang, Contracting Freight Agent for the Louisville & Nashville at Memphis, has been promoted to the position of Division Freight Agent for the Memphis division, to succeed Mr. Julien F. Gracey, resigned.

—Mr. A. C. Wilson, son of United States Postmaster-General Wilson, and formerly connected with the West Virginia Central & Pittsburgh Railroad, has been appointed Traveling Passenger Agent of the Baltimore & Ohio road.

—Mr. T. E. Blanchard, of Columbus, Ga., was last week appointed permanent Receiver of the Columbus Southern road by the United States Circuit Court at Atlanta. He has been in charge of the property as temporary Receiver for some weeks.

—Mr. F. H. Peters, Chief Engineer of the Galveston, La Porte & Houston, has severed his connection with the company, and Mr. H. J. Simmons, one of the Texas State Railroad Commissioners' engineers has been elected to fill the vacancy.

—Captain James Murry, of St. Catharine's, Ont., one of the most prominent contractors in Canada, died at his home suddenly last week. In addition to extensive contracts from the Canadian Government on the Welland Canal, he had large contracts for public works all along the St. Lawrence and Great Lakes. He was Vice-President of the Northwest Central Railroad.

—Mr. Charles F. Mattes, Third Vice-President of the Lackawanna Iron and Steel Co., died at Scranton, Pa., on Sept. 3, aged 76 years. He had been connected with the company 55 years, entering its employ as a clerk early in 1841, rising to be Vice-President and General Manager of the great interests of the company. In recent years he had been in charge of real estate matters.

—Mr. William Truby, Division Superintendent of the Pittsburgh & Western road has resigned to accept the position of Superintendent of the docks at Painesville, O., where he will succeed J. R. Irwin, deceased. Mr. Truby has been Superintendent of the Pittsburgh & Western for five years when he was appointed to the position in 1890, he was connected with the Sharpsville road.

—Mr. Richard Gentry, Chief Engineer of the Kansas City, Pittsburg & Gulf Road, has resigned, and Mr. Robert Gillham, Chief Engineer of the Metropolitan Street Railway Company, of Kansas City, has been appointed in Mr. Gentry's place. Mr. Gentry has been with the Kansas City, Pittsburg & Gulf since it was organized. He was formerly Second Vice-President and General Manager of the company.

—Mr. Daniel Coxe, Superintendent of the Delaware, Susquehanna & Schuylkill road, died at Drifton, Pa., on Sept. 6, from a peculiar accident. Mr. Coxe had constructed near his residence a miniature railroad on which he ran a locomotive of 5 H. P. of his own construction. While operating this locomotive it was derailed and turned over, Mr. Coxe falling underneath it. It was not at first thought that he was seriously hurt, but he died later in the day from internal injuries. He was a nephew of the late Eckley B. Coxe, and had been connected with the Coxe coal mining interests at Drifton all his business life.

—Colonel H. S. Haines has resigned the office of Vice-President of the Plant System, the resignation being announced this week by President Plant. This action is assumed to mean the confirmation of the report that Colonel Haines will be elected Commissioner of the new Southern Freight Association. Colonel Haines is so well known as a railroad man that any notice of his career here is unnecessary. He has been with the roads forming the Plant System for over 30 years, and has been General Manager since 1880. A few years ago he made New York his headquarters, which brought him near his birthplace, Massachusetts, but his long residence in the South so identified him with that part of the country that he is probably not completely satisfied to be removed from that section. He has been President of the American Railway Association and its Predecessor, the General Time Convention, since April, 1887.

—Mr. John Gordon has resigned the office of General Manager of the Northern Steamship Company, which he has held since its organization. He will hereafter give all his time to his interest in the Union Transit Co., which operates a fleet of boats on the Great Lakes. Mr. W. C. Farrington, General Manager of the Eastern road, one of the divisions of the Great Northern, has been appointed Vice-President of the Northern Steamship Co., and for the present at least will assume the duties of General Manager, succeeding Mr. Gordon. Mr. Francis B. Clarke has been appointed General Traffic Manager of the company, this being a new office. Mr. Clarke was formerly General Traffic Manager of the Chicago, St. Paul, Minneapolis & Omaha, but resigned that office on account of ill health. After returning from a long European trip, Mr. Clarke settled at Superior, Wis., and has been General Manager of the Consolidated Land Co. of that town.

ELECTIONS AND APPOINTMENTS.

Clarion.—The following are named as directors of this company just organized in Pennsylvania: President, D. H. Jack, Bradford, Pa.; A. R. Macdonough and C. W. Buchholz, New York City; C. V. Merrick, F. A. Fralick, C. W. Gardner and W. M. Boyce, Bradford.

Louisville & Jeffersonville Bridge Co.—The company was reorganized last week, electing officers as follows: President, George J. Long, Louisville; Treasurer, F. D. Comstock; Secretary, M. L. Akers; Directors, M. E. Ingalls of Cincinnati, George J. Long, A. P. Humphrey and Joseph Huffaker of Louisville and M. Z. Standard of Jeffersonville. M. L. Akers will have charge of the bridge and Big Four terminals.

New York, Susquehanna & Western.—A meeting of the stockholders was held in Jersey City, Sept. 5. The following named directors were elected: Amos L. Hopkins, Roswell Eldridge, Simon Borg, Henry Sanford, H. O. Armour, Henry B. Plant, Thomas A. McIntyre, Cornelius C. Cuyler, Garret A. Hobart, George W. Young, Cyrus J. Lawrence, W. Lannon Bull, and Gustav Kissel. The only members of the former board retained are Messrs. Borg, Armour, Sanford, Hobart and Eldridge. The following officers were elected: Amos L. Hopkins, President; Roswell Eldridge, Vice-President and Treasurer; John Spencer, Secretary; and E. E. Gardner, Assistant Treasurer.

Orford Mountain.—At the annual meeting last week Judge Foster was re-elected President and Gardner Stevens Secretary-Treasurer.

Ottawa & Gatineau Valley.—At a meeting of the shareholders held last week, the following directors were elected: J. P. Mullarky, H. J. Beemer, M. S. Lonergan, of Montreal; W. D. Harris and J. Currier, Ottawa; E. A. Hoare and H. G. Beemer, Quebec.

Toledo & Ohio Central.—The annual meeting was held last week, and the following directors were re-elected: Stevenson Burke and R. W. Hickox, of Cleveland, and J. M. Ferris, of Toledo. The board as now constituted consists of the above and C. J. Canda, T. C. Platt, C. Ledyard Blair and J. S. Stanton, of New York; Chas. C. Hickok, of Cleveland, and A. W. Scott, of Toledo.

Wabash.—At the annual meeting of the stockholders, held at St. Louis, Sept. 10, the Directors of last year were unanimously re-elected. O. D. Ashley, of New York, was elected President. The Directors will meet in New York this month and elect two vice-presidents, a secretary and a treasurer.

Western of Alabama.—A meeting of the stockholders was held at Montgomery last week. The meeting was purely a routine one. The old Board of Directors was re-elected, as follows: M. H. Smith, A. M. Cady, W. F. Shellman, J. M. Falkner, R. M. Green and H. M. Comers. At a subsequent meeting of the directors, President Geo. C. Smith was unanimously re-elected.

Wheeling & Lake Erie.—The following circular has been issued by General Manager Blair, announcing changes in the company's organization: The offices of General Superintendent and Chief Engineer will be separated because of increased duties of the Chief Engineer. C. A. Wilson will continue in charge as Chief Engineer, reporting to the General Manager. Robert Blickensderfer is appointed General Superintendent in charge of operation, reporting to General Manager. F. J. Stout is appointed Superintendent in charge of train service, reporting to the General Superintendent. Station Agents will be under the immediate jurisdiction of the Superintendent in all matters relating to the transportation department, subject to the direction of the General Superintendent. The office of Superintendent of Transportation is abolished.

The Chief Train Dispatcher and his assistants, also Telegraph Operators, will be under the direct jurisdiction of the Superintendent, who will report to the General Superintendent all matters affecting the operating department, and to the Superintendent of Telegraph in matters relating to changes in the line, expenses, etc. The mechanical departments will report to the General Superintendent in all matters relating to engines and cars in active service, and to the General Manager in all matters of shop expenses, regulation and maintenance of equipment. All matters of expenditures in any department must be authorized by the General Manager before taking effect.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Albemarle & Raleigh.—This road, which extends to within 30 miles of Raleigh, N. C., which was intended to be the terminus of the road when the building of it was begun, may soon be completed to that city by the Southern Railway. The matter came up and was discussed at length by the directors of the North Carolina road, when that road was re-leased to the Southern Railway last month, and while there was no binding agreement between them and the authorities of the Southern Railway, it was tacitly understood that the latter would soon consider the feasibility of the plan, with the prospect that it would be carried out in due season.

Canadian Pacific.—The Kaslo & Slocan branch, in Southern British Columbia, has 1,000 men at work, and is expected to be running this fall. A level grade has been found from Bear Lake to Landon, and the way is being cleared up from Cody Creek.

It is stated that this road is to build a branch into the Traill Creek gold mining district of southern British Columbia, and that it will be hauling ore from there by spring.

Chauteaugay & Northern.—Howard, Leamy & Murphy have received the contract for the 12 miles of the belt line at Montreal, the first division of this road, from Hochelaga to Bout de l'Isle.

Clarion.—This company filed a charter at Harrisburg last week to build a road from a point on the Dagus Branch of the New York, Lake Erie & Western near Dagus Cahonda, in Elk County, Pa., to a point on the same road in the Borough of Johnsonburg in Elk County, Pa. The length of the road will be 11 miles. D. H. Jack, Bradford, Pa., is President.

Columbus, Huntington & Guyandotte.—The stockholders of the proposed road have authorized the directors, who meet in New York this week, to issue first mortgage bonds to the amount of $25,000 a mile. The proposed road opens up a new coal territory, situated south of Huntington, W. Va.

Erie & Central New York.—The grading work now going on out of Cortland, N. Y., is being done by the Otselic Construction Co., of which N. A. Bundy, of Brooklyn, N. Y., is president. The line now under construction is about 16 miles long from Cortland, N. Y., southwest to Cincinnatus. This section of the road, as already stated, was nearly all graded a number of years ago, and the grade to-day is in fair condition. The track will be laid on this section during the fall, and then the further extension of the line will be undertaken. The average grade is 45 ft. to the mile and the maximum curvature is 4 degs. W. D. Tidsdale, of Cortland, N. Y., is President of the railroad company, and the other officers are H. M. Kellogg, Secretary, and J. S. Squires, Treasurer, both of Cortland. Walter M. Meserole is Chief Engineer of the Construction Company. The latter company's main office is at 189 Montague street, Brooklyn.

Houston & Texas Central.—Grigsby Bros., of Dallas, Tex., have the contract for a short road from Calvert station to the Brown coal mines.

Hudson River & Washington County Midland.—This company was incorporated in Albany, N. Y., last week to operate a steam road seven miles long from Schuylerville, Saratoga County, to Greenwich, Washington County. The capital is $125,000, and the directors are Charles K. Phelps, James Cameron, William M. Kennedy, of New York City; Sanford Stewart, Norman F. Stewart, James J. Wells, Watson B. N. Sprague, of Greenwich; William H. McCall, of Saratoga Springs, and William Orr, of North Adams, Mass.

Kewaunee, Lake Superior & Southern.—This company filed a charter in Wisconsin last week, the proposed route being discribed as from Superior through Prentice to Trenina, Wis., on the Chicago, Milwaukee & St. Paul Railroad, about 380 miles. The capital stock is $4,200,000. The incorporators are principally Eastern capitalists, Robert L. Belknap, of New York, former Treasurer of the Northern Pacific, being at the head of the enterprise.

Kingston, Smith Falls & Ottawa.—The survey of the road, under the superintendence of Mr. Hamilton Lindsay, has been completed as far as Smith's Falls, Ont. It is expected that the work of construction will be commenced next spring.

Missouri, Kansas & Texas.—It is reported that the company has secured by formal purchase the line 35 miles long now in the course of construction from Green Ridge to Holden, Mo. The consideration was $1, but the Missouri, Kansas & Texas agrees to assume all the obligations of the new road and complete it. By the construction of this new road the company secures a through route from St. Louis to Kansas City. The construction of the road was undertaken early this summer as a branch of the Missouri, Kansas & Texas, to complete a gap between two divisions of that company's line, to form a new through route between St. Louis and Kansas City.

New Roads.—O'Neill Bros., contractors, are building a lumber road for the Weyerhauser syndicate in Wisconsin from Snake River, near the Great Northern, in a northwesterly direction to Mile Lacs, 25 miles. They expect to complete 12 miles this season.

New York & Pennsylvania.—The hearing on the application of the Railroad Company for permission to construct its road, which came up before the New York Railroad Commissioners, at Albany on Sept. 10, was postponed until Oct. 15, in order to give the company an opportunity to amend its articles of incorporation, so as to show the termini more specifically. The road is to be constructed in Alleghany and Steuben counties, in the southern tier of counties in New York.

Ottawa, Arnprior & Parry Sound.—Rails have been laid four miles west of Whitney, Ont., and within 10 days the first 10 miles beyond that point will be open for traffic.

Philadelphia & Erie.—Messrs. Candor & Co., of Loch Haven, Pa., have the contract for grading the roadbed for the branch to the brick works at Farrandsville, Pa.

Pontiac & Renfrew.—This company is pressing its claim to a subsidy from the Dominion Government at the rate of $3,200 a mile. An amalgamation is talked of with the Pembroke Southern, which is incorporated to build from Pembroke to connect with the Ottawa, Arnprior & Parry Sound at Renfrew, Ont.

Quebec Central.—Hold & Lukes, contractors, Montreal, have completed tracklaying for the branch from Triny to Megantic, Que. The branch is to be open soon for regular traffic.

Sebasticook & Moosehead.—The directors have left the contract for building the extension of its road to Harmony, Me., to E. T. Mitchell, of Portland, and work has begun. The nine miles of road must be completed within 90 days. The railroad commissioners have approved the location and nothing now prevents the construction of the line which is an extension north from the present terminus at Athens.

Southern Pacific.—A party of engineers and surveyors are working in the Sierra Mountains near Boca, locating a line about 18 miles long from Boca to Independence Lake for a new branch of the Central Pacific road. Division Superintendent Wilder has examined the country through which the new line is to run and made a report to the General Superintendent and the Executive Department of the company. The country to be traversed by the branch from Boca Junction is heavily timbered, with the exception of five miles from the Central Pacific, which has been cleared. The new branch will tap the richest portion of the Sierra pine forests. The land almost exclusively belongs to the Hobart estate, which is interested in the enterprise with the corporation. At Independence Lake there will be many inducements for summer resorts.

Tecumseh & Guthrie.—A charter has been granted this company in Oklahoma. The directors are John B. Otto, Henry Loop, E. B. Mundy, T. M. Phaup, G. B. Leighton, J. B. Gaylord, E. C. Nichols, A. T. Foster, S

S. Rains, D. W. Cronin, J. S. Scott, T. J. Huckaba and S. Clay. The road will be built from Guthrie to Tecumseh, Oklahoma, and then on southwest through the Chickasaw coalfields and on to Texas.

Tilsonburg, Lake Erie & Pacific.—Contracts have been signed for the construction of this road from Port Burwell on Lake Erie, thence northerly to Tilsonburg, Ont., where connection will be made with the Grand Trunk and Michigan Central. A steam ferry line will be operated across Lake Erie to connect with some of the coal ports on Lake Erie. W. T. Jennings, of Toronto, is Chief Engineer.

Toronto, Hamilton & Buffalo.—The contract for building the Welland branch of the road has been awarded to M. P. Chapman & Co., of Watkins, N. Y. The first 15 miles have been sublet to Maxey, Larsen & Co. The grading is expected to be finished by October.

Whippany River.—This road, four miles long, from Morristown to Whippany, N. J., with a branch of one mile to Malapardis, N. J., built to take the business of five pasteboard mills to the Delaware, Lackawanna & Western Railroad at Morristown, is now carrying freight. It is bonded for only $5,000 a mile, and it is expected will earn interest from the start. J. E. Melick, who was one of the three engineers to inspect the Union and Central Pacific roads for the government in 1887, and who built the Rockaway Valley road, and was Superintendent for seven years, is the President. G. W. Downs is Vice-President; R. B. McEwen, Treasurer; F. A. Melick, Secretary. The principal office is in Morristown, N. J. Free passes will be given to any one wishing to locate factories of any kind along this river to use the water power so near New York.

GENERAL RAILROAD NEWS.

Atlantic & North Carolina.—The directors of this road, which extends from Goldsboro to Morehead City, N. C., and which is principally owned and operated by the State of North Carolina, have decided not to declare the customary dividend, but to apply the earnings of the road to making betterments, especially in improving its bridges and rolling stock. The road is 102 miles long.

Baltimore & Ohio.—A correspondent in North Carolina understands, from conversations with officials of the Cape Fear & Yadkin Valley and the Roanoke & Southern (which roads form a line from Roanoke, Va., through portions of Piedmont and Central North Carolina to the sea coast at Wilmington, N. C., with over 400 miles of track), that a plan has been considered to transfer these roads to the control of the Baltimore & Ohio. They state that the scheme is not a new one, but has been under advisement for some time prior to President Mayer's departure for Europe, and that when, upon his return this month, Vice-President King submits the report of the recent tour of inspection made by him and Receiver Gill, of the Cape Fear & Yadkin Valley, he will be prepared to give it immediate attention.

Under the proposed arrangements, the Baltimore & Ohio will secure valuable connections to the far South with all three of the great roads now operated in Virginia, the Carolinas and Georgia, via., Southern Railway, Seaboard Air Line, Atlantic Coast Line, with the former, at Winston (with the Northwestern N. C. road branch), and at Greensboro (with the main line); with the Seaboard Air Line at Sanford and Wilmington; with the Atlantic Coast Line at Fayetteville and Wilmington, at which latter place connection will also be made with the W., C. & A. road for Charleston, Columbia, Augusta, Savannah and the far South.

Brockville, Westport & Sault Ste. Marie.—An engine and 10 box cars, the property of this railroad, were sold at auction by the Dominion Government last week to satisfy a claim of $1,000 for unpaid customs duties. The engine was bid in by the Grand Trunk for $700, that company having a claim of $1,600 against the engine for repairs. The cars were bid in at $21 each by the superintendent of the company.

Central of Georgia.—The foreclosure sale of this road, and also of the Savannah & Western, has been fixed for Oct. 7. The property of both companies will undoubtedly be purchased by the Reorganization Committee, and it is expected that the new company organized under the plan promulgated by Messrs. Thomas and Ryan will take charge of the property about Nov. 1. The purchase of the smaller lines of the system will take some little time and new leases will have to be prepared. New leases with the Augusta & Savannah and the Southwestern road will be promptly made, the security holders of those companies having agreed to the terms offered their securities in the new reorganization plan. The security holders of the Macon & Northern have recently assented to the reorganization plan, leaving the Chattanooga, Rome & Columbus, the only important line operated by the Central of Georgia which has not yet assented to the proposed terms of the reorganization.

Chicago, Peoria & St. Louis.—The sale of the property has been postponed until Sept. 21, by order of Judge Allen, of the State Court at Springfield, Ill. Prospective purchasers asked for the postponement.

Columbus, Sandusky & Hocking.—The sale of the road is set for Sept. 14, at Bucyrus, O. Under the conditions of the sale the road is to be sold in two sections and then offered as a whole. The minimum selling price of either section is $750,000. The northern section is the original "Columbus & Sandusky Short Line," of 111 miles, from Columbus, O., to Sandusky, through Delawara, Marion, Bucyrus and Bellevue. The southern section of 140 miles long, from Columbus to Zanesville and Shawnee into the Hocking coalfield.

Fitchburg.—The report for the year to June 30 gives following comparisons of earnings with the previous year:

	1895	1894.	Inc. or Dec.
Gross earn	$7,237,723	$6,865,155	I. $372,568
Oper. exp. and taxes	5,202,424	5,038,169	I. 164,255
Net earn	$2,035,299	$1,826,986	I. $208,313
Interest and rentals	1,286,456	1,309,689	D. 23,233
Balance	$748,843	$517,297	I. $231,546
Dividends	681,866	502,000	I. 179,866
Surplus	$66,977	$15,297	I. $51,680

Georgia & Alabama.—The plan for the rehabilitation of the Savannah, Americus & Montgomery promulgated last week provides for raising $1,675,000 to pay off the indebtedness of the company, extend the road from Lyons to Savannah, and provide for the improvement of the property. A new corporation has been formed under the above name. This company will issue first mortgage preference five per cent. gold bonds, redeemable after five years at 105 and interest. The total issue will be limited to $4,000,000, and of this amount $2,210,000 has already been issued. First mortgage consolidated five per cent. gold bonds to the amount of $6,000,000, of which $3,060,000 has been issued, and non-cumulative preferred stock to the amount of $3,400,000 will also be issued. Common stock will be issued to the amount of $5,100,000.

Green Bay, Winona & St. Paul.—The committee of income bondholders and stockholders has made a tentative agreement with the committee of consolidated bondholders of the company for the reorganization of the corporation. A new company is to be formed, which shall issue $2,500,000 capital stock, $600,000 class "A" debentures and $7,000,000 class "B" debentures. All the new common stock shall be issued to the holders of the first mortgage and the consolidated mortgage bondholders of the company, the debentures of each class to be delivered to each holder of $1,000 income bonds who shall pay to the Reorganization Committee the sum of $40 in cash, $40 in class "A" debenture bonds, and $600 in class "B" debenture bonds; to each holder of 100 shares of preferred stock who shall pay $450, $450 in class "A" debentures and $5,000 in class "B" debentures; to each holder of 100 shares of the common stock, who shall pay an assessment of $450 in cash, $450 in class "A" debentures and $4,500 in class "B" debentures. The proceeds of the assessment are to be applied in discharging prior liens, court costs, expenses of foreclosure, organization of the new company and to secure needed equipment and appliances and for the betterments of the property.

Iowa Central.—The company reports the following results of operations for the fiscal year ending June 30:

	1 95.	1894
Gross earn	$1,569.221	$1.811,567
Oper. exp	1,048,821	1,198 589
Net earn	$520.400	$612,978
Rentals	14,751	14,425
Total income	$535,151	$627,403
Int., taxes and renewals	465,188	481,242
Surplus	$69,963	$146,161

Kentucky Midland.—This road, operated from Frankfort, Ky., to Paris, 40 miles, was offered for sale in foreclosure proceedings at the upset price of $320,000 at Frankfort on Sept. 2. No bid was received for the property and the sale was adjourned.

Knoxville, Cumberland Gap & Louisville.—This road, from Knoxville to North Cumberland Gap, a distance of 65 miles, was sold at Knoxville, Sept. 2, by a Special Master of the United States Court. It was bid in by F. W. Whittridge, of New York, for the bondholders at the upset price of $600,000.

Long Island.—The company reports its earnings for the year ending June 30 as follows:

	1895.	1894.	Inc or Dec.
Gross earn	$4.014,019	$4.143,433	D. $129.411
Oper exp	2,593,323	2,690,084	D. 96,761
Net earn	$1,420,696	$1,453,349	D. $32,653
Other income	498,089	431,256	I. 66,883
Total	$1,918,785	$1.884.605	I. $34,180
Fixed charges	1,414,632	1,364,950	I. 49,682
Balance	$404,153	$519.655	D. $15,502
Dividends	480,000	570,000	D. 90,000
Surplus	$24,153	def. $50,345	I. $74,498

New York, New Haven & Hartford.—The preliminary statement of results of operation for the year to June 30, makes the following comparisons:

	1895.	1894.	Inc. or dec.
Gross earn	$27,608,009	$25,281,875	I. $2,326 134
Oper. exp	19,064,027	17,932,709	I. 1,131,318
Net earn	$8,543.982	$7,349,166	I. $1,194.816
Other inc	528 552	404,490	I. 124,062
Total inc	$9,072,534	$7,753,656	I. $1,318,878
Fixed charges	5,593,545	5,379,978	I. 213,562
Balance	$3,478,989	$2,374 678	I. $1,105,311
Dividends	3,794,290	3,631,292	I. 162.998
Deficit	$315,301	$1,257,614	D. $942,313

New York, Pennsylvania & Ohio.—The first mortgage bondholders of the road, at a meeting in London, have passed a resolution approving the Erie reorganization scheme.

Omaha & Republican Valley.—Suit has been commenced in the United States Circuit Court at Topeka to foreclose two mortgages against the road, which extends from Valley, Neb., to Manhattan, Kan. Both suits are brought by the American Loan & Trust Co. One of the suits is to foreclose a mortgage of $3,136,000 and the other one is $1,246,000. The road has been operated by the Union Pacific.

Port Royal & Western Carolina.—Application will be made before Judge Simonton, of the United States District Court, in Charleston, for an appeal from the terms of the decree for the sale of the road. It is understood that one of the objections to the decree is that it allows compound interest on the bonds in default.

Toledo & Ohio Central.—The annual report to June 30 makes the following comparisons of earnings with 1894:

	1895.	1894.	Inc. or dec.
Gross	$1,903,990	$1,660,734	I. $243,256
Oper. exp	1,298,405	1,132,815	I. 165,591
Net earn	$605,584	$527,919	I. $77,665
Other income	9,421	11,828	D. 2,488
Total	$615.005	$539,818	I. $75.187
All charges	424,165	367,378	I. 56,886
Balance	$190,740	$172,439	I. $18,301
Tonnage	2,110,507	1,950.013	I. 160,000
Rate per ton per mile	.563c	.602c	D. .039c
Passengers	569,180	525,003	I. 44,177
Rate per mile	1.921c	2.202c	D. .281c

Valley (O.).—Representatives of the Baltimore & Ohio bought the Valley Railway property at the United States Court sale at Cleveland, O., Sept. 10. The Baltimore & Ohio was the only bidder, and the property was sold for $3,070,000.

Waco & Northwestern.—This road was sold at Fort Worth, Tex., on Sept. 6 on the foreclosure of the company's first mortgage, to Wilbur F. Boyle, of St. Louis, for $1,550,000. The road was built as a division of the Houston & Texas Central and was operated for some years by that company, but was not included in the foreclosure sale of that property. It is 55 miles long from Bremond to Waco and Ross, Tex. The property was sold in 1892 to E. H. R. Green, President of the Texas Midland road. Mr. Green claimed that the land grant of the company was included in the property offered for sale, but the court held to the contrary and allowed Mr. Green to withdraw his bid. A report that the purchaser at Fort Worth on Sept. 6 represented the interests of the Missouri, Kansas & Texas was promptly denied.

TRAFFIC.

Traffic Notes.

Late advices from Texas indicate that the cotton crop will be from 20 to 30 per cent. below that of last year, but the crop will be large unless worms do damage to it. The crop last year was phenomenally large. It is probable that the prices realized by the producers will be enough better this year to more than make up for the reduction in the volume of cotton.

The great state of Texas, in the persons of its honorable railroad commissioners, has had to descend to the humiliating office of reducing the freight rates over a railroad to make them low enough to take traffic away from a teamster. On Aug. 24 the San Antonio & Aransas Pass was authorized to reduce its rates to the basis of 14 cents per 100 lbs. first class between San Antonio and Elmendorf. Whether the wagons are drawn by oxen or mules is not stated, but evidently the railroad, aided and abetted by the commissioners, has hitherto been slower than either.

Chicago Traffic Matters.

CHICAGO, Sept. 11, 1895.

Eastbound freight rates are generally considered firm, with but little change in the situation. There is undoubtedly considerable deviation from tariff on some of the lines, but all the managers are waiting for developments at the meeting of Presidents in New York this month, and are, consequently, unwilling to make any marked attempt at rate cutting. Eastbound shipments last week showed a slight increase over the preceding week, not enough, however, to justify any charge of unusual manipulation.

Western rates are generally shaky, and nothing except the prospective large tonnage prevents some of the lines from openly meeting secret rates, which they have substantially positive information are being made. The situation in Texas is especially bad, and it would not be surprising if open reductions of some of the commodities to and from Texas points are made before long.

The regular bi-monthly meeting of the freight committee of the Central Traffic Association convened yesterday. The subjects under consideration are mostly of a routine nature. Two subjects, however, are of more than local importance. One, a proposition from the transcontinental lines for a restoration of through rates and divisions of the westbound transcontinental traffic, and the other, rates and divisions on lumber from Wisconsin points, in connection with the Lake Michigan car ferry. This is the first time the latter line has been subject to rate-making in the association, but it is confidently predicted by the managers of the ferry that it will hereafter cut an important figure in the Northwestern situation.

Reports have been current for some time of various irregularities on the part of immigrant agents at New York in reporting and turning over Westbound business to the Western lines' clearing house. A committee of Western Passenger Agents has recently been to New York and reports that matters were found in a satisfactory condition, and that the rumors were in a large measure unfounded. As this agreement is the only one now operative among the Western lines, they are quite jealous regarding its satisfactory work.

For the first time in over a year the statement can be made that the Western Passenger Agents are not at work on a new agreement. The indications are that they have finally concluded that it is useless to make a new agreement so long as the Atchison and Union Pacific are disinclined to join.

Passenger representatives of the Chicago and Omaha lines have notified their agents at Omaha to redeem any round-trip tourists' tickets bought in the market, hoping thereby to stop the scalping of these tickets that is going on at Omaha.

The Illinois Railroad and Wareheuse Commissioners were in session last week, considering complaints which had accumulated during the summer. The Cairo Short Line and the Wabash and the Illinois Central applied to the Commission to have their roads restored to class B of the schedule classifications, as was in effect prior to the change last July. The representatives of the roads claim that they operate so many branches and minor lines, that to grade them in class A was altogether higher than they could stand. Several of the roads ask for reduction in assessments of rolling stock. Another subject under consideration by the board is the failure of some of the lines to insert in their tariffs all the rules recently laid down by the Commission when they revised the Illinois classification. It is understood that the roads omitting some of the rules have done so for the purpose of bringing the matter directly before the Commission, expecting to be able to show that these rules would work an injustice and believing that the Commission, upon a presentation of the facts, will authorize a modification of their ruling. The Commission adjourned until yesterday without rendering any decisions.

Lake rates fluctuated considerably last week, closing firm with an advance of 10 cents a ton on both coal and iron ore. Grain shipments fell off considerably from the preceding week. Shipments were: 49,846 barrels of flour; 58,046 bushels wheat; 1,148,474 bushels corn; 291,256 bushels oats.

The shipment of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending Sept. 7, amounted to 57,232 tons, against 56,095 tons during the preceding week, an increase of 537 tons, and against 44,183 tons for the corresponding week last year The proportions carried by each road were:

Roads.	WEEK TO SEPT. 7.		WEEK TO AUG 31.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	6,221	10.9	5,724	10.2
Wabash	6,116	10 7	6,939	12.3
Lake Shore & Mich. South.	7,034	12.3	6,265	11.2
Pitts., Ft. Wayne & Chicago	7,733	13.5	6,187	11.0
Pitts., Cin., Chi. & St. Louis.	7,693	13.4	8,615	15.4
Baltimore & Ohio	3,635	6.4	3,544	6.1
Chicago & Grand Trunk	7,782	13.5	6,708	12.0
New York, Chic. & St. Louis	3,575	6.2	3,905	7.0
Chicago & Erie	5,211	9.1	6.267	11.2
C., C., C. & St. Louis	2,229	4.0	1,941	3.6
Total	57,232	100.0	56,095	100.0

Of the above shipments 1,176 tons were flour, 19,474 tons grain and mill stuff, 12,344 tons cured meats, 9,285 tons dressed beef, 1,682 tons butter, 1,217 tons hides, and 5,764 tons lumber. The three Vanderbilt lines carried 29.4 per cent., the two Pennsylvania lines 26.9 per cent.